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Commercial Fisheries Abstracts

a monthly summary of important developments for the fishery industries

PERIODICAL
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Washington D. C.

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FRED A. SEATON, SECRETARY

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Commercial Fisheries Abstracts

DIVISION OF INDUSTRIAL RESEARCH AND SERVICES
BUREAU OF COMMERCIAL FISHERIES

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Following is a brief outline of this filing system. The numbers apply to the first digit appearing on each card. For the meaning of subsequent digits, please see the above described leaflet.

0 General and theoretical	3 Preserved fish	7 Analytical Methods
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2 Fresh fish	5 Vitamins	9 Miscellaneous
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Use of funds for printing this publication has been approved by the Director of the Bureau of the Budget November 23, 1956.

0.118 A FOOD GRINDER-RECORDING AMMETER METHOD FOR MEASURING BEEF TENDERNESS

Emerson, J. A. and Palmer, A. Z. (Florida Agricultural Experiment Station, Gainesville, Florida)
Food Technology 14, 214-216 (May 1960)

Introduction. -- Consumer preference studies indicated that tenderness as an attribute of beef acceptability is important and that the use of an accurate objective measure of beef tenderness in the standards for grading carcass beef would be desirable. Existing objective measures of tenderness lack reliability, simplicity, and convenience; therefore, a definite need exists for an improved technique of measuring beef tenderness. This technique should incorporate as many of the chewing processes as possible to approximate more closely the taste-panel method of evaluating tenderness. Miyada and Tappel (1956) were the first to report the use of a motorized food grinder for the determination of beef tenderness; Bockian et al. (1958) compared objective and subjective measurements of beef tenderness with promising results. Bratzler (1932 and 1949) measured shear force, which is one of the forces involved in chewing.

Purpose. -- In this study, two trials were conducted to compare the tenderness of loin steaks and rib roasts. Tenderness values were obtained by the use of a food grinder-recording ammeter device, by the use of the Warner-Bratzler shear technique, and by the use of a taste panel of four judges.

Findings. --In trial 1, the taste panel was found to be the most reproducible method of evaluating tenderness in broiled beef. The other two methods closely followed the taste-panel method. With raw samples, the food grinder was found to be the least reproducible method. Correlation coefficients showed a higher relationship between the taste panel method and the Warner-Bratzler method (–0.73, –0.53, –0.56, –0.62) than between the taste-panel method and the food grinder-method (–0.60,

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 ABSTRACTER: Martin Heerdt

0.5 INDIGENOUS MARINE BACTERIOPHAGES

Spencer, R. (Humber Laboratory, Hull, England)
Journal of Bacteriology 79, 614 (April 1960)

Introduction. -- The presence in sea water taken from beyond the littoral zone of bacteriophages active against marine bacteria has not been conclusively demonstrated despite their possible importance in marine microbiology. ZoBell (Marine Microbiology [1946]) has isolated phages from sea water taken from the littoral zone but not from water taken from beyond this zone. The phages from the Black Sea that were isolated by Kriss and Rukina (Rept. U.S.S.R. Acad. Sci., 57, 833 [1947]) were active against such typically terrestrial species as Bacillus subtilis and Micrococcus albus (Kriss et al., Trans. biol. Sta. Sebastopol 7, 50 [1949]) and may thus have been adventitious. In contrast, the phage that was isolated by Smith and Krueger (J. Gen. Physiol. 38, 161 [1954]) and that was found to be active against a marine vibrio was not strictly marine in origin. Attempts, therefore, were made to isolate phages from sea water taken from well beyond the littoral zone with the hope that they would be active against typically marine bacteria.

Experimental. -- Sea water samples were obtained from the North Sea, some 10 miles off Aberdeen, Scotland. After preliminary experiments, two methods of isolation were used in parallel, one direct and one indirect, each with incubation at 20° and 0° C.

The direct method consisted of layering onto a nutrient agar base, 10 ml. of sea water that had been previously filtered through a membrane to remove interfering bacteria, and 2 ml. of a dense suspension of the appropriate bacterial culture. The presence of any phage active against that particular culture after incubation was detected by plaque formation. Samples (600 ml.) of sea water were incubated at both 20° and 0° C. and were normally examined against 40 different strains of bacteria.

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 ABSTRACTER: Martin Heerdt

0.33 PATTERN OF REDNESS LOSS AND REGENERATION IN PREPACKAGED BEEF

Dean, Robert W. and Ball, C. Olin (Rutgers University, New Brunswick, New Jersey)
Food Technology 14, 222-227 (May 1960)

Introduction. --At the present time, meat is packaged in coated cellophane at atmospheric pressure. The film allows oxygen from the atmosphere to reach the meat, and the coating retards the loss of moisture from the meat. The oxygen results in the temporary retention of a pleasing bright red color or "bloom" after packaging. Within 48 hours, this bloom is replaced by a brown discoloration that is unacceptable to the consumer. The loss of redness, which will occur during the time needed for transportation from a central point, makes centralized prepackaging unacceptable and, in fact, prevents the packaging of meat at any other place than in the individual store.

Experimental. --In 1949, an investigation was started by the Departments of Animal Husbandry and Food Science of Rutgers University to find a method of packaging, which would permit centralized prepackaging of fresh meat. This study was based on vacuum-packaging.

Preliminary results. -- Fresh meat packed under vacuum lost its red color very quickly. A high vacuum and a high storage temperature resulted in a high rate of color change. Within 2 weeks, however, the meat that was vacuum-packed in cans usually regained its red color. The task (1) of learning how to accelerate the return of red color in cans and (2) of finding a transparent film in which the action could be duplicated was then initiated. Since a perfect vacuum could not be obtained in the can, the authors reduced the size of the can in comparison to the volume of the sample and brought about an accelerated return of red color. Finally, a 211x011 can, in which the sample occupied at least 90 percent of the can volume, was selected for the present investigations.

(over)

 ABSTRACTER: Martin Heerdt

1.013 PERUVIAN ANCHOVY: THE WORLD'S LARGEST FISHERY

McHugh, J. L. (U. S. Bureau of Commercial Fisheries)
Fish Boat 5, 35, 60-61 (May 1960)

The recent rapid growth of the Peruvian anchovy fishery, which has doubled its catch yearly since the first reduction plant was put into operation in 1950, is contributing to the difficulties being experienced by the United States menhaden industry today. Last year nearly two million tons of Peruvian anchovies were landed, which is almost twice as much as the United States menhaden catch. These anchovies were processed into 300,000 tons of fish meal and 19,000 tons of oil. Most of this production was exported.

The author discusses the Peruvian fishery and its potential.

The Peruvian coastline, which lies just south of the equator, is approximately as long as the combined coasts of Washington, Oregon, and California. In spite of its tropical location, the climate of the Peruvian coast is relatively mild, with a mean annual temperature of 70° F. and a range of from 55° to 90° F. From the Andes to the coast, the land is a parched and barren desert, except where the land has been irrigated from the coastal streams. The situation is a paradox--a temperate climate in a tropical land, a coastal desert adjoining an ocean teaming with life, perhaps one of the richest fishing grounds in the sea.

The essential basic conditions, which exist simultaneously nowhere else in the world in quite such perfect balance, are a wind system that drives the warm surface waters away from the coast, to be replaced by cool, nutrient-rich water from below, and a narrow continental shelf, which brings the deep rich waters close to shore.

(over)

 ABSTRACTER: Kathryn L. Osterhaug

0.33 (Cross Reference: 7.51, 7.592)

Results.--Cuts of beef that were vacuum-packed in materials of low permeability to air recovered their red color by the second, third, or fourth day of storage. Samples of beef that were packed in cans usually recovered their red color by the second day of storage, although one set of samples in cans did not recover until the third day of storage. In some experiments, samples of beef that were packed in film pouches made from polyethylene-cellophane-polyethylene, Mylar-Saran-polyethylene, polyethylene coated with polyvinyl alcohol, or aluminum foil-polyethylene recovered their red color in 2 days. In another series, samples of beef that were packed in polyethylene-cellophane-polyethylene, Mylar-Saran-polyethylene, polyethylene coated with polyvinyl alcohol, or Mylar-polyethylene showed an increase in redness after 3 days of storage. One series of samples in polyethylene coated with polyvinyl alcohol did not show substantial regeneration of redness until the fourth day of storage. Once regeneration of redness occurs, the red color of beef is relatively stable. Although some sharp decreases or increases in redness may be noted at certain stages of storage, the trend after the fourth day during a storage period of 14 days or more is toward either a gradual increase or a gradual decrease in redness.

Beef cuts that recovered their red color within 2 days after packaging appeared to have greater stability of subsequent redness and less variation in redness during storage than did beef cuts that recovered their redness in 3 days after packaging. The three most successful materials among those used consistently in this investigation for vacuum-prepackaging of fresh beef were small cans, aluminum-foil polyethylene, and polyethylene coated with polyvinyl alcohol. An excellent pattern of redness was achieved with these three packaging media. Samples of beef that were packaged in polyethylene coated with polyvinyl alcohol, however, were less stable in red color than were samples that were packaged in cans or aluminum-foil polyethylene.

1.013

The incredible richness of the living resources of the sea in this region has been poorly understood because no permanent scientific investigation had been organized until recently. Estimates of the abundance of anchovies have been made by ingenious methods based on the abundance of birds that feed on them and on the known rate at which guano is deposited on the off-shore guano islands. It has been estimated that the guano birds consume more than five million tons of anchovies each year. The present fishery represents the amount of fish that 20 million birds once ate.

0.118

−0.27, −0.61, −0.33). The food grinder-method was more highly correlated with the taste-panel method in an evaluation of broiled samples than in an evaluation of raw samples (−0.48, −0.26, −0.39, −0.24).

In trial 2, using both raw samples and cooked samples of roasts, the food-grinder method provided good reproducibility of results. With cooked samples, a higher correlation was found between the taste-panel method and the Warner-Bratzler shear method (−0.79) than between the taste-panel method and the food-grinder method (−0.47).

Conclusions.--Under the conditions of this investigation, the Warner-Bratzler shear method appears to offer a more precise measurement of tenderness than does the food grinder-method.

0.5

With the indirect method, 300 ml. of sea water was mixed with 100 ml. of quadruple strength nutrient broth and 8-ml. amounts of broth culture from four different strains of bacteria. After incubation, the bacteria were removed either by filtration or by an adaptation of the chloroform technique of Fredericq (Compt. rend. soc. biol., 144, 295 [1950]). The bacteria-free preparation then was tested for lytic action against the appropriate bacterial strains by the direct method of layering onto a nutrient agar base. Samples of 3 liters of sea water were incubated both at 20° and at 0° C. and were normally examined against 40 different strains of bacteria.

Results.--In all, 6 liters of sea water was examined by the direct method and almost 40 liters was examined by the indirect method. Seven phages were isolated. Four of these phages were detected by the parallel direct and indirect methods at both 20° and 0° C.; three were present in samples in a concentration of 1 to 5 particles per 10 ml.; and one was present in a concentration of approximately 100 particles per 10 ml. The remaining three phages were detected by the indirect method.

One phage was active against a strain of Photobacterium phosphoreum, three were active against unidentified nonpigmented Pseudomonas species, two were active against an unidentified Flavobacterium, and one was active against an organism provisionally classified as a Cytophaga species.

2.01 THE SANITATION OF FISH BOXES. I. THE QUANTITATIVE AND QUALITATIVE BACTERIOLOGY OF COMMERCIAL WOODEN FISH BOXES

Spencer, R. (Department of Scientific and Industrial Research, Humber Laboratory, Hull, England)
Journal of Applied Bacteriology 22, 73-84 (April 1959)
Torry Memoir No. 23

Many studies have been made of the bacterial flora of various species of marine fish and of the changes that take place during their storage in ice. Comparatively little attention, however, has been paid to the bacterial floras of the environment of fish after they have been caught, except for the ice used to hold fish on board the fishing boat. In spite of the fact that fish containers probably are the first source of incidental contamination of fish on land, little attention has been paid to their bacteriology. One purpose of the work reported here was to investigate the bacterial flora of one type of wooden fish box as part of a general survey of the sanitation of the distribution of fish.

Experimental.--Wooden fish boxes in which the fish are unloaded from the trawlers were used in these experiments. The filled boxes generally lie for several hours on the quayside until the fish are sold and taken to the fish plant for processing. The boxes used in these tests were taken from commercial fish houses soon after they had been emptied.

The boxes were washed with cold water using a low-pressure jet. One set of boxes, however, was washed with a high-pressure jet. After the boxes had been washed they were steamed by being inverted over a steam jet for 1 hour. Some of the boxes were kept for 48 hours in a cool place before they were sampled.

Two methods of sampling were used--a swabbing method and a scraping method. In the swabbing method, a marked area of the internal surface, approximately 4.8 by 7.8 cm., was swabbed with

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 ABSTRACTER: Kathryn L. Osterhaug

2.01 DISCOLORATION OF CHILLED MEAT BY NITRITE OF MICROBIAL ORIGIN

Empey, W. A. and Montgomery, W. A. (C.S.I.R.O., Division of Food Preservation, Homebush, N.S.W., Australia)
Chemistry and Industry No. 17, 468 (April 23, 1960)

Introduction.--The authors have studied an unusual mode of nitrite-induced discoloration of beef and mutton carcasses during short periods of holding in chill rooms at 34° to 40° F. The induced discoloration appeared as a form of (1) browning of the surface muscle tissue, (2) bleaching of the surface muscle tissue, and (3) bleaching of the surface fat to a depth of about 3 mm.

Findings.--If the rooms were cooled by natural air circulation over ammonia coils sprayed with 10 percent sodium chloride, discoloration appeared (1) only in surface tissues contaminated by condensate drippings from the ceilings and (2) only when the nitrite concentration as $NaNO_2$ in the condensate exceeded 40 p.p.m. Free ammonia was always present in the condensate and in the brine spray, but nitrite was virtually absent from the brine. From 0.5 to 2 hours were required for discoloration to appear after water had dripped on the carcasses.

If the rooms were cooled by natural air circulation over ammonia coils sprayed with tap water, a condensate did not appear on the ceiling, but discoloration appeared on most of the surface area of a large percentage of the carcasses. This type of discoloration appeared far less frequently than did discoloration from ceiling condensate. Free ammonia was always present and nitrite concentrations as $NaNO_2$ ranged from 10 to 1000 p.p.m. in the spray water. Droplets of water containing nitrite were not carried over from the spray into the air circulating over the carcasses. Discoloration appeared only when the spray water fell below pH 5.5 and when its nitrite content as $NaNO_2$ was greater than 150 p.p.m.

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 ABSTRACTER: Martin Heerdt

2.117 COMFORT, EFFICIENCY STRESSED IN SECOND BENSON STEEL SEINER-LONGLINER

Anonymous
Western Fisheries 60, 18-22, 24-26 (April 1960)

The 78-foot 8-inch steel combination boat Pacific Harvester and her sister ship, Dominator, are reported to be the fastest fish boats of their type on the British Columbia coast. They are heavily powered with twin tandem diesel engines and develop 440 h.p. These boats incorporate some interesting hull innovations, including a long, flat run aft. The boats respond quickly and are extremely maneuverable.

Speed, undoubtedly, is one of the most remarkable features of the two boats. The tandem-mounted diesels each develop 220 h.p. at 18,000 r.p.m. They are fitted with a 5:1 hydraulically operated gear coupled to a $4\frac{3}{4}$-inch bronze shaft that turns a 66-inch by 51-inch bronze propeller at 360 r.p.m. The engines are fitted with electric starting through the use of a 32-volt, 50-amp. alternator. A 5 kw. 110-volt alternating current generator is driven by a diesel auxiliary engine. Total power generated on the ship is 8,000 watts.

A 60-h.p. hydraulic driven power take-off clutch mounted on the after engine drives the seine and anchor winches, the compressor, and other auxiliary equipment.

The fish hold is lined entirely with 2-inch red cedar and is completely refrigerated. Two 3-inch self-priming pumps, one driven off the auxiliary and the other off the main engine are installed. A $1\frac{1}{4}$-inch pump runs steadily during halibut fishing to keep the hold dry.

Two of the latest model echo sounders are installed. One is a 530-fathom graph, and the other

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 ABSTRACTER: Kathryn L. Osterhaug

2.145 HOW RESEARCH IN OCEANOGRAPHY CAN HELP THE FISHING INDUSTRY

Eckles, Howard H. (U. S. Bureau of Commercial Fisheries, Washington, D. C.)
Fish Boat 5, 38-41 (May 1960)

How many fish of all kinds are there in the sea? What is their distribution? How do they respond to various stimuli? What factors control their abundance? How can fish be caught at exactly the right time in their life cycle to ensure maximum reproduction?

Research in oceanography can help solve many of the problems facing the fishing industry. Oceanographic research of the future might, for instance, provide complete knowledge of how fish react to combinations of various stimuli. At present, we know that some fishes make noises and that others react to sounds of various kinds. Possibly fish could be attracted or repelled by sound vibrations of the proper frequency and intensity.

Fish also respond to traces of chemicals and to visual barriers such as a curtain of air bubbles, black dyes, and light. The movement of fish can be controlled by electricity.

It is conceivable that a fishery of the future might operate as follows: an underwater craft, possibly powered by an atomic reactor, is used to scout a 5-mile area to chart the distribution and numbers of fish. Underwater television, echo rangers, and direct visual observations are used to search for fish. Four surface vessels, one mothership and three smaller boats, following the directions of the underseas craft, approach from the edges of the area towing sound vibrators that herd or drive the fish toward the center of a circle. As the vessels converge the fish are concentrated within a radius of half a mile. One of the vessels then places an electric cable and chemical dispensing hose around the fish. These can be drawn in to further concentrate the fish by dispensing

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 ABSTRACTER: Kathryn L. Osterhaug

2.01

All observed outbreaks of discoloration appeared in carcasses held for 1 to 2 days or longer in closed cool rooms.

Meat that was exposed to (1) solutions of various nitrites or (2) nitrogen dioxide gas liberated from these solutions at pH 5.5 or less became discolored. These findings established a direct relationship between nitrite and both forms of discoloration.

Bacteriological examinations of the condensate and spray water revealed the presence of viable bacteria, which had the characteristics of Nitrosomonas. In mixed cultures with a variety of associated heterotrophic bacteria, ammonia was oxidized to nitrite either in synthetic inorganic media or in condensate and spray water held at either 25°C. or 5°C. Production of nitrite from ammonia by the heterotrophs growing in these media was insignificant.

Recommendations. -- Meat discoloration can be controlled in rooms with brine-cooling systems by cleaning and disinfecting the ceilings to reduce or eliminate nitrite in the condensate. In rooms with water spray-cooling systems, discoloration caused by atmospheric transfer of nitrogen dioxide has been prevented either by maintaining the pH of the spray water above 7.0 or by periodically disinfecting with chlorine to reduce populations of Nitrosomonas to low levels.

2.145

traces of chemical solutions and visual dyes to assist in the control of the fish. An electric current pulls the school tight and raises them to a large pump that draws them aboard the mothership. Suitable manipulation of the current may be used to sort the fish by size, or even by species, as the fish are pumped aboard.

Conveyor belts are used to carry the fish through filleting machines, after which they are packaged and frozen or preserved by atomic radiation. The whole operation, resulting in the harvest of all fish of the desired species and size in a 5-mile area, requires about 2 hours.

This highly efficient method of fishing, which admittedly is rather imaginative in terms of today's knowledge, could probably be achieved if enough is learned about the sea and the fish in it. It presupposes that we know as much about animals in the seas as farmers do about those on land.

Besides revolutionizing the methods for harvesting the open ocean, new research can lead to the development of other ways of producing fishery products, including farming the edge of the sea and growing shrimp, crabs, oysters, clams, and fish in ponds or estuaries. Under controlled conditions, more desirable products could be developed through selective breeding, predators could be controlled, and the environment could be manipulated to improve the quality and rate of growth of the animal involved.

It is easy to foresee that, in time, wide expanses of the open ocean and many coastal areas will be fished or farmed to increase our protein supply. Many species, not now utilized, will be brought to market. There will be need for radical changes in methods of fishing and our concepts about use of products from the sea. The National Academy of Sciences has told scientists in the government, and the fishing industry what must be done to accomplish this goal. The gains can be substantial but only after long-term, painstaking research, which should be started without delay if we are to compete with other countries or even maintain our present position among the fishing nations.

2.01

alginate wool that was then dissolved in 90 ml. of normal strength Ringer's solution plus 1 ml. of a solution of 10 percent sodium hexametaphosphate. This solution was mechanically shaken for 10 minutes and added to 9 ml. of Ringer's solution. From this 10^{-2} solution, further decimal dilutions were made. Ringer's solution was used as the diluent because it compares favorably with aged sea water.

In the scraping method, a similar marked area was thoroughly scraped with a razor blade. The material removed from the box was wiped from the razor blade with an alginate swab, and the procedure then used was identical with the swabbing method. The boxes were sampled in two positions: along the center board at the bottom and along the center board at one of the short sides.

Total counts were made and an analysis was made of the bacterial flora. To obtain an overall picture of the major bacterial groups present and of their proportions, as well as to determine to what extent particular groups were being selected by the various methods of determining bacterial count, single, well isolated colonies were picked off at random from the various count plates of samples taken from dirty boxes, washed boxes, and washed and steamed boxes. Generally, 20 colonies were picked off from each count, which resulted in a grand total of 1,068.

Results. -- The results of this investigation indicate that spoilage of white fish is caused mainly by bacterial action and that, at least on board the trawler, spoilage is the result of the indigenous psychrophilic flora of the fish. Probably different bacterial groups predominate at different stages of spoilage. Later additions of similar psychrophilic bacteria from the environment will increase the spoilage potential and, when fish is held on land at higher temperatures, contamination by mesophilic terrestrial bacteria may be important.

The cleaning efficiency of hosing wooden fish boxes with cold water, the usual commercial practice, was very low, even when high-pressure jets were used. After washing, the internal surfaces of the boxes could still carry up to 20×10^6 bacteria per $cm.^2$. Even prolonged steaming failed to sterilize the surfaces. Coryneform organisms accounted for over 50 percent of the total bacterial flora, although these have usually been reported as present in only low proportions on both fresh and spoiling fish. The major subsidiary groups were species of Achromobacter and Pseudomonas, constituting about 18 percent and 14 percent of the population, respectively. A few micrococci and flavobacteria were also present.

2.117

is a 480-fathom indicator or flasher. Other electronic equipment installed includes automatic loran and radar.

A 10-man inflatable life raft is carried on the upper deck in a fiber-glass container with hydrostatic release.

On the Pacific Harvester can be seen the results of unusual concern for the comfort and convenience of the crew and the skipper. The crew's quarters are unusually spacious. Panelled throughout with mahogany, they contain two washrooms, one toilet, and one shower.

The skipper's cabin and wheelhouse probably are the largest of any fishing vessel of this type. There are two bunks in the skipper's cabin, a desk that folds flat against the wall, a full-sized chart table with three 36-inch by 38-inch chart drawers. Mounted above the chart table are two late-model radio telephones with 12 channels.

3.12 PROCESSING AND QUALITY STUDIES OF SHRIMP HELD IN REFRIGERATED SEA WATER AND ICE PART 2 - COMPARISON OF OBJECTIVE METHODS FOR QUALITY EVALUATION OF RAW SHRIMP

Collins, Jeff; Seagran, Harry; and Iverson, John (Technological Laboratory, Ketchikan, Alaska)
Commercial Fisheries Review 22, 1-5 (April 1960)

Information in the technical literature indicates that a refrigerated sea-water system has several potential advantages over conventional icing for use with Alaska shrimp. In 1959, Collins reported that pink shrimp that had been held in refrigerated sea water could be peeled satisfactorily by machine.

Before the usefulness of refrigerated sea water could be fully evaluated, however, information was needed on how the quality of the shrimp is affected by holding and processing variables. To accomplish anything in this field, objective methods for assessing quality were necessary. The purpose of the work reported here was to determine which of the available objective tests is most suitable to evaluate the quality changes that take place in shrimp held in refrigerated sea water.

Experimental. -- The general experimental approach was (1) to hold batches of shrimp for a period of time in refrigerated sea water and in ice, (2) to make quality measurements at regular intervals using both objective and subjective tests, and (3) to determine which of the objective tests correlated most closely with the subjective judgments.

The following analyses were carried out on samples of shrimp that had been subjected to different treatments: total nitrogen, oil, total solids, ash, total chloride, total volatile base, total volatile acid, trimethylamine, glycogen, and nonprotein nitrogen. In addition to these objective tests, the whole, raw, cold shrimp were judged for odor after each interval of storage time.

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ABSTRACTER: Kathryn L. Osterhaug

3.234 FREEZING AND THAWING OF FISH

Anonymous
Redogörelse för Arbetsåret July 1, 1958-June 30, 1959. Svenska Institute För Konserveringsforskning, Göteborg, Sweden SIK Report No. 71, 37-38 (1959)

The influence of the elapse of time after the capture of fish on the fluid-binding capacity of frozen fillets of cod after thawing and also on the dephosphorylation of adenine triphosphate (ATP) and the solubility of the proteins have been studied. In other laboratories, it was found that fillets of fish that had been frozen before rigor mortis showed a strong concentration of the fibers and a consequent high amount of drip when thawed. It also is claimed that dephosphorylation of ATP occurs during storage of the frozen fish. The theory is that a normal storage time should bring about dephosphorylation of ATP and thus no concentration of the muscle should occur after thawing and also no excessive drip. The experiments have been carried out by courtesy of the Royal Fisheries Board of Sweden whose ship Skagerak has been used for these experiments. Two cod-fishing trips have been undertaken in the fiords of Bohuslän.

The fluid-binding capacity as determined by centrifugation at 1,300 g. Hydrolysable P, and solubility of the protein was determined in unfrozen cod at progressive intervals, after they were caught, up to 10 days' storage in ice. At the same intervals of time, samples of cod fillets were frozen. The frozen fillets were thawed and studied a few days after freezing, as well as after 3 months' storage at -20° C.

The results of the experiments show that the fluid binding capacity of the fillets has its highest value in unfrozen fish before rigor sets in and decreases with storage time in ice. The amount of centrifuged fluid was about 10 percent in freshly caught fish, and this value increased to nearly 20 percent of the weight of the fillet after 10 days' storage in ice.

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ABSTRACTER: Kathryn L. Osterhaug

3.230 MOISTURE LEVELS IN FROZEN POULTRY AS RELATED TO THAWING LOSSES, COOKING LOSSES, AND PALATABILITY 1. CHICKEN BROILERS

Froning, Glenn W.; Swanson, Milo H.; and Benson, H. N. (University of Minnesota, St. Paul)
Poultry Science 39, 373-377 (March 1960)

Introduction. --Modern processing procedures for poultry that include slush ice-chilling to achieve prompt cooling give rise to questions concerning the optimum moisture level for processed poultry. The objectives of the work reported here were (a) to determine the variation in thawing losses that occur among chicken broilers processed and frozen so as to contain a wide range of tissue moisture; (b) to relate chilling method and time to moisture content of both the uncooked (thawed) and cooked broiler tissues; (c) to measure the effect of the chilling procedure on cooking losses; and (d) to ascertain the role of tissue moisture in the palatability of the cooked broiler as measured by juiciness and flavor scores.

Materials and methods. --Seventy chicken broilers grown under uniform conditions of feeding and management so as to minimize initial differences in carcass composition were used in this study. Forty-eight hours before slaughtering, the birds were randomly divided into two equal groups. Both water and feed were withdrawn from the first group in an attempt to partially dehydrate the tissues of the broilers. The second group was supplied with a wet mash and water ad libitum up to the time of processing.

Following dressing and evisceration, broilers from each of the above groups were killed, dressed, eviscerated, and randomly divided into five subgroups for chilling prior to packaging and freezing. One of the subgroups was air chilled for 96 hours; three of the subgroups were chilled in ice slush for periods of 4, 24, and 48 hours; and the fifth subgroup was packaged warm, without chilling. Broilers

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ABSTRACTER: Martin Heerdt

4.11 COLORIMETRIC REACTIONS OF UNSATURATED FATTY ACIDS WITH METAL SALTS

Rhodes, D. N. (Low Temperature Station, Downing Street, Cambridge, England)
Journal of Applied Chemistry 10, 122-124 (March 1960)

Introduction. --A simple colorimetric reaction of the double bond of the common unsaturated, long-chain fatty acids that is capable of quantitative exploitation would be desirable. The determination of cholesterol by the method of Zlatkis et al. (1953) and Henly (1957) depends on the development of a red color when the alcohol or its esters are treated with ferric chloride in concentrated sulphuric and acetic acids. It has recently been shown that unsaturated acids, often present in the tissue lipid extracts examined, produce a spurious color that interferes seriously with the determination. The nature of the colored products formed between pure unsaturated esters and various metal salts has now been examined, and conditions giving high and reproducible color yields suitable for analytical use have been defined.

Method. -- Up to 100 mg. of oil are weighed into a flask and refluxed for 1 hour with 5 ml. of absolute methanol containing 1 percent of concentrated sulphuric acid. The solution is made up to 25 ml. with glacial acetic acid.

Analytical reagent grade glacial acetic acid (4 ml.) containing the required concentration of metal salt is pipetted into 25-ml. test tubes with standard ground stoppers, 3 ml. of concentrated sulphuric are added from an all-glass syringe pipette, and the tubes are shaken vigorously and placed in a water bath at 60° C. After 5 minutes, the test sample is added in a solution of 1 ml. of acetic acid, and the tubes are shaken and returned to the bath. After 20 minutes the tubes are cooled in tap water, and the viscous solutions are poured into 1-cm. cuvettes and evacuated briefly to

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that had been subjected to liquid chilling, were uniformly drained and packaged in polyvinylidene bags that were evacuated and shrunk.

Thawing was accomplished by holding the packaged broilers overnight at room temperature. For taste-panel evaluations, the broilers were individually roasted in table-top electric rotisseries for the equivalent of 6 minutes per each 100 grams of carcass weight. Total cooking losses were ascertained by weighing the birds before and after cooking. Coded samples of breast and thigh muscle were scored independently for flavor and juiciness.

Results.--The withdrawal of feed and water versus the feeding of a wet mash had virtually no measurable effect on subsequent moisture levels of the processed broilers. Air-chilled broilers, however, lost 17.7 percent moisture before they were packaged; and this, in turn, was undoubtedly responsible for a loss of only 0.15 percent when they were thawed. Broilers that were packaged warm to prevent either a gain or a loss of moisture during chilling lost 1.9 percent moisture when they were thawed. As reported by other investigators, weight gains of carcasses chilled in slush ice continued to increase as the chilling time was lengthened; however, there was essentially no difference between thawing losses sustained by birds that had been chilled for 24 and 48 hours, respectively.

Air-chilled broilers were significantly lower in moisture content both before and after cooking than were ice-chilled broilers. Differences in the moisture content of cooked broilers, however, narrowed somewhat, and in the case of the thigh samples, there were no significant differences among any of the five chilling methods. Cooked breast samples from air-chilled broilers, however, were significantly lower in moisture than were cooked breast samples from the other four broilers.

In general, panel members preferred the flavor of the carcasses lowest in moisture content. There was little variation in the mean flavor scores for broilers from the air chilled, no chill, and 4-hour ice-chilled groups. Broilers chilled for 24 and 48 hours in slush ice yielded significantly lower flavor scores.

4.11 (Cross Reference: 4.20)

remove bubbles before the extinctions are read against a blank.

Results.--Under the conditions stated above and with concentrations of ferric chloride (hexahydrate) between 0.0025 and 0.0625 percent, pure methyl linoleate and linolenate gave colors showing absorption maxima at 446 and 478 mμ which obeyed Beer's Law at these wave lengths. The color yield per mg. of ester also showed a roughly linear increase when plotted against the logarithm of the ferric chloride concentration. The maximum difference between the absorbancies of the two esters at 478 mμ was found by using 0.0025 ferric chloride, under which conditions methyl oleate gave a negligible reaction and methyl palmitate gave no color.

The reactions of the mono-, di-, and tri-enoic acids with zinc chloride, aluminum chloride, and copper acetate were tried alone or with ferric chloride without useful results. Mercuric acetate, however, induced a more sensitive reaction than did ferric chloride with both oleic and linoleic esters; but the color with linolenic esters in this case was weaker. The absorption spectra of the mono and diene were almost identical, with a single broad peak (λ max. 405 mμ). The color yields increased with the concentration of salt, but no more than 0.05 percent could be used owing to the formation of opalescence after the addition of the sulphuric acid.

When the two reactions were applied to synthetic triglycerides of oleic linolenic acids the same extinctions were obtained as with the methyl esters. For this reason, the authors presumed that the methods could be applied directly to fats or oils. However, the sensitivity of the iron procedure was found to be insufficient to overcome the low solubility of linoleic-poor fats such as olive oil or lard in the reagent mixture. This necessitated the use of the partial transmethylation pretreatment. The resulting solution in glacial acetic acid was used directly as the test solution or after appropriate dilution. The possible use of these colorimetric reactions to supplement the established methods of analysis is restricted to cases in which no polyenes higher than triene are present. The iron method, in particular, offers a simple alternative to the alkali-isomerization procedure for measuring the linoleic acid content of natural fats and oils free of linolenic acid.

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Results and discussion.--The shrimp that had been held in ice remained fresh for 5 days, were stale on the 6th day, possessed a slight off-odor by the 8th to 10th day, and were definitely spoiled by the 13th day. The limit of acceptability could be set at about the 7th day.

The compressor of the refrigerating system used to cool the sea water-holding tanks malfunctioned for a period of several hours between the 4th and 5th day of storage. For this reason, these shrimp could not be compared directly with the shrimp that were held in ice. Although these fish appeared to be perfectly fresh on the 4th day, on the 5th day, after several hours at elevated temperatures, these shrimp had a definite spoilage odor.

Nevertheless, the objective tests were carried out on the shrimp and the results were found to be of value. Certain of the objective tests picked up the spoilage that resulted from the malfunctioning of the refrigeration system whereas others did not.

From the data obtained, the following objective tests were concluded to be suitable: (1) trimethylamine and volatile acids, as indices of bacterial spoilage; (2) amino nitrogen, nonprotein nitrogen, and total nitrogen, as indices of enzymatic action; and (3) total solids and total chloride, for general characterization. The "closed" system will be used in subsequent studies, since no differences were found by the methods employed in this study between shrimp held in the two refrigerated sea-water systems (except those caused by temperature differences).

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The frozen and thawed fillet has a lower fluid-binding capacity than the fresh fillet. The freshly caught and frozen fish thawed after 3 days, lost 24 percent of its weight by centrifugation, whereas fish that had been stored for 10 days' before freezing lost 27 percent of its weight. The figures increase after storage at -20° C. After 3 months' frozen storage, the corresponding values were 34 and 38 percent.

The results found in other laboratories, from which the conclusion was drawn that fish should not be frozen before rigor mortis, have not been reproduced. The analyses of ATP, however, show that a rapid dephosphorylation of ATP occurs during thawing of fish frozen before rigor, but this splitting off of phosphorus does not seem to be accompanied by contraction of the muscle. Experiments are going on to elucidate the course of the dephosphorylation under thawing of prerigor frozen fish.

3.236 BACTERIAL CONTENT OF COMMERCIALLY FROZEN BREADED SHRIMP

Kachikian, R.; Larken, E. P.; and Litsky, W.
Frosted Food Field 30, 50-51 (February 1960)

A study was conducted to determine whether recommended standards of 100,000 bacteria colonies per gram of frozen foods were realistic. Packages of frozen breaded shrimp were tested by the departments of Food and Technology, and Bacteriology and Public Health of the University of Massachusetts. One hundred and forty-four commercial samples representing 24 brands were picked up in 30 cities scattered over the United States and were used in the study. Standard techniques were used in testing for the total bacteria counts, coliform counts, and numbers of fecal streptococci. The bacteria counts varied from a low of 21,500 to a high of 54 million bacteria per gram. Only 7 percent of all the samples showed counts less than 100,000 bacteria per gram, 36 percent had counts less than 500,000 bacteria per gram, and 61 percent had bacteria counts of less than 1,000,000. The variation in count was great, indicating that the cause of variation should be determined.

The public health aspects also indicate a need for a uniform and workable sanitary standard for frozen breaded shrimp. The number of coliform bacteria varied from 0 to 700 per gram. It was noted that there was little or no correlation between the high coliform counts and high total bacteria counts. Numbers of fecal streptococci found in the samples varied from 2 to 13,500 per gram. The number of fecal bacteria exceeded that of the coliform bacteria and there is a closer relationship between the total bacteria count and the number of fecal streptococci. It was concluded that a standard of 100,000 bacteria per gram of frozen breaded shrimp was not illogical, and use of a standard for numbers of fecal streptococci appears more logical than using coliform counts.

ABSTRACTER: Wayne I. Tretsven

3.2493 THE EFFECT ON FLAVOR OF HOLDING FROZEN CHICKEN FOR SELECTED PERIODS

Mountney, G. J.; Branson, R. E.; and Hurley, W. C. (Texas A and M College System, College Station)
Poultry Science 39, 287-289 (March 1960)

Introduction.--Branson and Mountney (1958), in a survey of 745 poultry buyers in selected supermarkets, found that only 30 percent of the buyers had ever purchased frozen whole chicken and only 26 percent had ever purchased frozen chicken parts. Of the group which had purchased frozen chickens, 57 had unfavorable comments. Twenty-nine percent of those who had purchased whole chickens and 16 percent of those who had purchased cut-up chickens stated that frozen chicken was tasteless. Stewart, Hanson, Lowe, and Austin (1945) demonstrated that frozen chicken loses flavor during storage. In their work, a trained taste panel was able to detect changes in quick-frozen broilers held for 51 days at -10° F.

Purpose.--The present experiment was designed to determine whether the resistance toward the use of frozen chicken can be justified on the basis of flavor alone.

Procedure.--Cut-up, quick-frozen chickens packaged in paraffin-coated cartons with cellophane overwraps and stored at 0° F. were obtained from a commercial processor. Before the carcasses were cooked, they were held overnight at 35° F. to thaw, after which they were cooked unseasoned in a Westinghouse electric oven.

Each of 1,500 visitors to the Texas State Fair in Dallas was given bite-size samples of chicken that had received one of the storage treatments. After tasting, the visitor was asked to indicate on a card the sample that he preferred or that he had no preference. To eliminate positional bias the

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ABSTRACTER: Martin Heerdt

3.237 NUTRITIVE VALUE OF FRYING OILS

Anonymous
Nutrition Reviews 18, 119-121 (April 1960)

Introduction.--The types of compounds responsible for the toxic effects of over-heated fats are peroxides and polymeric products. Peroxides are produced largely under conditions of moderate temperature in the presence of air, whereas the polymeric products or probably cyclic monomers are produced under high-temperature anaerobic conditions. Two questions that have not been answered are (1) what is the damaging mechanism in both types of toxic agents and (2) what amounts of such agents actually are formed in fats used in standard cooking processes?

Reports.--In a recent paper, E. G. Perkins and F. A. Kummerow (J. Nutrition 68, 101 [1959]) reported an investigation of the nutritive properties of corn oil stirred with air at 200° C. for 48 hours. This thermally oxidized oil was converted into fatty acids. These were separated by urea fractionation into an adduct- and a nonadduct-forming portion. The adduct-forming portion accounted for 64 percent of the total, and it probably was composed of straight-chain fatty acids. The nonadduct-forming portion accounted for 36 percent of the total, and it probably was composed of polyunsaturated and branched or cyclic acids or polymeric products. The nonadduct-forming portion was subjected to molecular distillation at 1 to 3 μ pressure and 150° C. to separate monomeric from polymeric fractions.

All fractions were fed to weanling rats as 12 percent of a diet that contained 50 percent glucose, 31 percent casein, 2 percent additional fat (fresh cottonseed oil), 5 percent salt mixture, and adequate supplements of water- and fat-soluble vitamins. Rats that were maintained on the nondistillable, nonurea-adduct-forming fraction lost weight and died within 7 days. Rats that were maintained on (1)

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ABSTRACTER: Martin Heerdt

3.63 FOAM-MAT DRYING IS BETTER, SAY U. S. RESEARCH WORKERS

Anonymous
Food Manufacture 35, 153 (April 1960)

A new process, known as "foam-mat" drying, has been developed by technologists of the Agricultural Research Service of the U. S. Department of Agriculture, and is claimed to convert certain foods into high quality food powders that can easily be reconstituted even in cold water.

It involves whipping liquid food concentrates into a foam with the assistance of certain additives, spreading the foam on a belt or tray, and compressing and crushing it into powder. So far, powders of good color and flavor have been made from the juices of tomatoes and fruit; from whole and nonfat milk; and from other liquid foods.

It is claimed that the fine structure of the foam remains stable even when the dried form is compressed into pellets, so that the powders can be readily reconstituted even with iced water. The foam-dried powders have the advantage of holding less moisture at a given relative humidity than spray-dried foods, and are, therefore, said to be less liable to cake. According to the research workers, the amount of additive needed is about 1 percent of the dry solids in the concentrate being whipped. Close control of foam density is obtained by careful adjustment of the quantity of additive and the amount of whipping. Commercial applications are being developed.

See illustrations, over.

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fresh corn-oil fatty acids, (2) the urea-adduct-forming fraction, or (3) the molecular distillate of the nonurea-adduct-forming fraction all gained weight normally and appeared to be in good health. Rat growth also was severely depressed by the total thermally oxidized fatty acids or the total nonurea-adduct-forming fraction. Dilution of the latter with an equal weight of fresh corn-oil fatty acids alleviated, but did not prevent, the growth-inhibiting action.

The authors suggest that the toxic fraction, which represents 30.6 percent of the original oil, is a relatively small proportion and that most of the oil is undamaged by the treatment. It is possible that the toxic material is actually present in considerably smaller amounts since previous reports claim that the actual polymeric fractions formed during anaerobic heating to 275° C. are not very toxic (Nutrition Reviews 15, 346 [1957]). Only part of the polymers may be responsible for the effects reported in this case.

In a study of fats actually used in frying, K. W. Keane, G. A. Jacobson, and C. H. Krieger (J. Nutrition 68, 57 [1959]) determined the caloric value of a hydrogenated cottonseed oil, which had been used for periods of 14 to 24 days in a commercial-frying operation. Used or fresh oil was incorporated as 23 percent of a basal diet, which was composed of 20 percent casein, 73.6 percent sucrose, 2 percent cottonseed oil, 4 percent mineral mixture, and adequate supplements of water- and fat-soluble vitamins.

The authors found, somewhat surprisingly, that the caloric values of the oil samples, as based on the caloric restriction technique described by E. E. Rice, W. D. Warner, P. E. Mode, and C. E. Poling (J. Nutriton 61, 25 [1957]), were directly related to the length of use of the oil in the frying process. They then searched for some chemical changes in the oil samples that might account for the changes in their nutritive properties. The authors found that the total nonconjugated double bonds increased in direct proportion to the caloric value. The same relationship also was found to be applicable to the different stages of hydrogenation of cottonseed oil.

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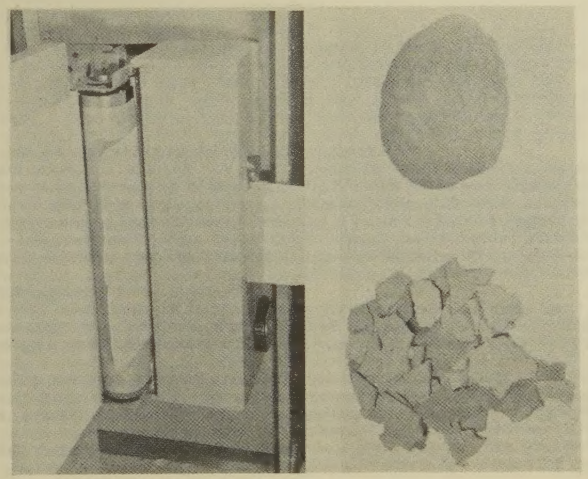

(Above) Tomato paste which has been dried after whipping, compressed to increase bulk density, and crumbled to a free-flowing powder. (Below) Continuous drying of foam to form a porous mat which readily discharges from a belt.

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time of the day, the day of the week, and the order of serving samples were alternated. No distinction was made between white and dark meat, except that the individual pairs of samples as served were both either white or dark meat.

Results.--Tasters that received two samples from the same fresh chicken selected the first sample 41 percent of the time and the second sample 45 percent of the time. About 14 percent said that they could detect no difference. Analysis of the data by Chi square method did not substantiate that the differences were significant. When samples of fresh chicken and samples that had been stored for 3 months were compared, 50 percent of the tasters chose the fresh sample, 40 percent chose the sample that had been frozen, and 10 percent indicated that they could detect no difference between the two samples. Analysis of the data by Chi square method gave significant differences for women tasters only.

Tasters who made comparisons between fresh samples and samples that had been stored for 9 months selected the fresh sample 58 percent of the time and the frozen sample 31 percent of the time. Analysis of the data showed that significant differences existed at the 1-percent level for women tasters and for the combined sexes. When samples of chicken that had been stored for 3 months were compared, with samples that had been stored for 9 months, 8 percent more of the tasters preferred the 3-month-old sample over the 9-month-old sample. Fifty-four percent of the women and 43 percent of the men selected the fresh sample over the sample that had been stored for 3 months. Despite all these advantages of the fresh samples only 58 percent of the tasters expressed a preference for them.

Conclusions.--Results obtained in this experiment indicate that only half of the tasters selected the fresh sample as their preference when it was compared with a sample that had been stored frozen for 3 months and that about three out of five selected the fresh sample when it was compared with a sample that had been stored for 9 months. The authors concluded that differences in the flavor of frozen chicken stored for 3 months or more will create a slight sales resistance toward this product.

3.25 TRANSPORTATION OF FROZEN FISH LAGGING

Young, Otto
Western Fishing 60, 64, 66-69 (May 1960)

The transportation of perishable foodstuffs is merely a modified storage problem because all of the conditions that are maintained in storages should be maintained during transportation. Unfortunately, the conditions supplied by most transportation systems fall short of what would be tolerated in storages.

Several systems of cooling railway cars have been developed whereby the target temperature of 0° F. can be approached. The situation with refrigerated trucks has been unknown to Canadian fisheries technologists, but the assumption was that they were doing a good job. This belief stemmed from the fact that trucks use mechanical refrigeration, which is given credit for being superior to other methods of refrigeration, such as ice and salt.

Because actual data on the performance of refrigerated trucks was not available, when questions arose in connection with the shipping of frozen fish under the "Canada Inspection" scheme, a survey was conducted to supply the missing information.

The survey involved 11 trucking companies and the investigation of 58 truck loads that had been refrigerated by the use of mechanical systems. The observations covered the temperature of the fish on loading, the duration of the trip, and the temperature of the fish at destination. With this information, the performance of the vehicle could be fairly well assessed.

The results of the survey demonstrated that none of the trailers maintained a temperature of 0° F. and only 10 percent of the trips provided a temperature of 9° F. or lower. Twelve percent of

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 ABSTRACTER: Kathryn L. Osterhaug

3.26 THE FROZEN SEAFOOD PICTURE TODAY

Wheeler, Murray (National Fisheries Institute, Washington 9, D. C.)
Quick Frozen Foods 22, 128 (April 1960)

The frozen fish and shellfish industry has seen more changes in the last few years than in any other comparable period of its history. When the 1-pound package of frozen fillets was introduced about 13 years ago, many people thought it was a passing fad that never would amount to anything. Ten years ago no one had heard of fish sticks and portions. In 1958, the production of these two items totaled 83 million pounds. During 1959 the trend continued with an increase to 97 million pounds.

Other phases of the industry also are experiencing change. In 1958, a total of 61 million pounds of breaded shrimp, 7.6 million pounds of peeled and deveined shrimp, and 2.1 million pounds of cooked shrimp were processed. Also, in 1958, 4 million pounds of breaded oysters and 7 million pounds of breaded scallops were processed. The progress in seafood marketing also includes frozen seafood dinners, boil-in-bag items, and fish soups.

Although distribution through food stores accounts for a large part of the increased sale of the new types of products, indications are that an even more important factor is the increased use of these products by such institutional outlets as fast food operations, mass feeding, and restaurants in general.

The success of these products can be attributed to the fact that the homemaker is confronted with increasing demands on her time and that the restaurant operator is faced with a steady increase in labor costs. "Heat'n eat" is a salvation to the homemaker's demand for convenience, and "ready-to-cook" products solve labor cost problems for the restaurant operator.

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 ABSTRACTER: Kathryn L. Osterhaug

FROZEN FISH TRANSPORTATION

PROGRESS IN FROZEN FISH INDUSTRY

3.4 FASTER SMOKING WITH ELECTRONICS

Gemmill, Arthur V.
Food Engineering 32, 79-80 (April 1960)

Introduction.--New speed in smoking meats, improvement in quality, more uniform smoke penetration, and a saving in floor space are four of the benefits accruing to a New York City firm through use of a recently installed electronic smoking unit. This unit has cut the smoking time of cured pastrami from a minimum of 8 hours in a conventional smokehouse to 30 to 35 minutes. Similar time-savings have resulted with such products as slab bacon, barbecued spare ribs, butts, corned beef, chickens, and turkeys.

How process is stepped up.--In a conventional smokehouse, smoking and moisture removal are carried out simultaneously. This necessitates raising the inside temperature of the meat to 120° to 155° F. depending on the type of product. To accomplish this with large pieces without overheating the outside of the meat requires long exposure to the warm smoke. The electronic unit performs the first of these two functions in a 3x10-foot electrostatic smoking chamber where the meat is literally bombarded with highly charged smoke particles. The second function is performed in an oven where the product is quickly heated throughout by infrared rays.

The smoking unit.--The unit is 30 feet long, by 3 feet wide, by 8½ feet high. It consists of three tiers, each with a motor-driven, endless stainless-steel wire belt, which is 2 feet in width. Variable drives on each motor permit adjustment of belt speeds to suit the requirements of the different products that are being smoked. The top two tiers each have a smoking chamber and an oven, whereas the bottom tier is open to allow the meat to complete its cook and to cool somewhat before it is removed. Products for smoking are transported from the cold room on monorail-mounted tree racks, transferred by hand to the infeed end of the top belt, and transported through the first

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 ABSTRACTER: Martin Heerdt

3.63 FREEZE-DRYING, DEHYDROFREEZING CONFUSED BY INDUSTRY: MACLINN

Anonymous
Frosted Food Field 30, 36 (May 1960)

Although the terms "freeze-dried foods" and "dehydrofrozen foods" often are used interchangeably, they each refer to a different processing technique. In an article entitled "Freeze-Dried Foods and Their Future for Refrigerated Warehouses," Dr. Walter A. Maclinn, director of The Refrigeration Research Foundation, explains the difference between the two.

As the name implies, dehydrofrozen foods are first dehydrated and then frozen for storage and shipment. The dehydration process is the conventional one of applying heat to drive off moisture. The food is not completely dehydrated, however, as only about 40 percent of the weight of the food is removed. The flavor and texture of some foods are protected by limiting the dehydration to this extent.

Because the food is only about one-half dehydrated, it is still perishable and must be frozen for holding or shipping. Dehydrofrozen foods are used by food manufacturers in the preparation of items such as canned soups or dinners.

Freeze-dried foods are relatively new. In fact, they still are in the testing stage. Laboratory samples have excellent color and flavor and rehydrate well.

As the name implies, freeze-dried foods are first frozen and then dehydrated. The food is frozen unpackaged, a slight amount of heat is applied in the presence of an air current, and

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 ABSTRACTER: Kathryn L. Osterhaug

FASTER SMOKING WITH ELECTRONICS

DEHYDROFREEZING VS. FREEZE-DRYING

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Although industry research and development has been progressing rapidly, the promotion of the new convenience products has not kept pace, according to Mr. Wheeler. With increased competition for the food dollar, large, industry-wide promotion programs become more important. Industry promotion effort must be great enough to persuade customers to buy and try new products.

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the trips maintained temperatures between 10° and 14° F. and 20 percent between 20° and 24° F. The remaining 15 percent of the trips were above 25° F.

Six reasons are given for this poor performance. The four reasons attributable to the trailer and operator are (1) inadequate provision for air circulation in the loaded trailer, (2) insufficient insulation in relation to the capacity of the cooling machine, (3) poor condition of the vehicle (moisture in insulation and cracks), and (4) insufficient precooling.

The two reasons that can be termed the responsibility of both the shipper and the consignee are (1) insufficient protection for the product during loading and unloading and (2) careless handling procedures.

Work is presently in progress at the National Research Council, Sussex Street laboratory to overcome the first four weaknesses. Out of these studies should come data that will overcome the weaknesses attributable to the vehicle and the operator. The fishing industry itself will have to deal with the other two weaknesses.

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dehydration occurs through sublimation. Freeze-dried foods are dehydrated to a low moisture content and therefore are less perishable than dehydrofrozen foods.

The early predictions were that freeze-dried foods would not need refrigeration. Experience with these products indicate, however, that low temperatures and controlled humidities are necessary to maintain the quality of the product and to insure easy rehydration.

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smoking chamber and the first oven. At this point, the product is discharged from the belt onto a stainless-steel plate and allowed to slide down to the second belt. This operation turns the meat so that the unexposed side will be subjected to the charged smoke particles in a second smoking chamber and to the heat lamps in a second oven chamber. As the product leaves the second belt it is moved onto another stainless-steel plate that transfers it to the bottom belt. At the end of this belt, the product is removed, hung on a previously emptied tree rack, and transported back to the cold room.

The smoking chambers of the unit are equipped with 12,000-volt direct-current, wire grids. These grids place a positive charge on the smoke particles so that they are drawn to the meat as it moves through the chamber on a grounded metal belt. The grids are suspended from the top of the chambers by cables so that they may be raised or lowered to accommodate various products.

Smoke is produced from hickory sawdust by a generator, piped to the unit through a duct that branches to feed each chamber separately, and directed downward on top of the charged grids. Electronic eyes near the entrance of each chamber continuously check the density of the smoke. Each heating oven contains six ceiling-mounted 4,500-volt infrared quartz lamps, which are 2 feet in length. These lamps are mounted in pairs with gold-plated reflectors above each pair. The lamps produce temperatures as high as 600° F.; however, they must be operated in cycles to raise the center temperature of the meat to the desired level without burning the outside.

4.29 THE INTRODUCTION OF n-ALKYL GROUPS INTO PHENOLS AND HYDROQUINONES

Armstrong, E. C.; Bent, R. L.; Loria, A.; Thirtle, J. R.; and Weissberger, A. (Kodak Research Laboratories, Rochester, New York)
Journal of the American Chemical Society 82, 1928-1935 (April 20, 1960)

Introduction.--Dialkylphenols and dialkylhydroquinones with alkyl groups of 3 to 18 carbon atoms are used in color photography. Properties such as melting point, solubility, diffusivity, and resistance to aerial oxidation of the side chains vary with the nature of the side chains, n-alkyl derivatives could be expected to offer advantages that would be of value in color photography.

The number of known alkylphenols and alkylhydroquinones is considerable, however, few authentic derivatives with two or more n-alkyl groups have been prepared. Direct alkylation has resulted in mixtures of isomers which differ in the location of the aliphatic chain on the ring and in the structure of the chain itself. Acylation in the presence of catalysts such as aluminum chloride (Friedel-Crafts, Fries) followed by reduction of the ketones, yields mono-n-alkylphenols and mono-n-alkylhydroquinone dialkyl ethers.

Cruickshank and Robinson (1938) prepared 2-n-amyl-5-n-octylhydroquinone by such reactions; however, the yield and difficulties in isolation and characterization of the product discouraged the present authors from using a similar route for the preparation of larger amounts of this compound. Moreoever, they verified that the acylation of 4-n-alkylphenols and of their ethers with an aluminum chloride catalyst resulted in an extensive isomerization of the n-alkyl groups. For example, 4-t-amylphenol was isolated from a reaction in which 4-n-amylphenol was involved. Mass spectrographic examination revealed isomerization of the amyl group of 4-n-amylanisole during an acylation reaction with $AlCl_3$ at 0° C.

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4.5 STUDIES ON THE CHEMICAL ESSENTIALS TO THE DISCOLORATION OF FISH OIL

Nonaka, Junsaku
Journal of the Tokyo University of Fisheries 43, 127-165 (March 1957)

Most edible fats and oils from land plants and animals, although subject to rancidity when exposed to air, do not suffer "rusting," a deterioration accompanied by strong discoloration. Fats and oils from aquatic sources, however, are subject to rancidity and also become discolored through rusting. A serious problem in the manufacture of marine products is the prevention of this discoloration.

The aims of the author in presenting this study were to discover the essential factors involved in the discoloration of fish oils and, through the control of these factors, to protect marine products from becoming "rusted." A chapter is devoted to each of the following major topics: (1) discoloration mechanism of fish oil, (2) studies of the oxidized oil, and (3) identification of the colored entity.

Some of the results obtained from these investigations may be summarized as follows: (1) autoxidation is a necessary preliminary to the discoloration of fish oil. Mere oxidation, however, does not result in discoloration--a second factor must be present in order to produce discoloration. (2) A considerable number of substances are recognized as being able to behave as the second factor. With dehydrated or frozen fish, the volatile basic nitrogen compounds present in the raw fish play the role of the second factor. This is related to the degree of freshness of the raw fish. (3) The essential coloring substance in discolored fish oil, although they may be derived mainly from rather highly unsaturated fatty acids, can also be traced to fatty acids of lower unsaturation and to saturated fatty acids containing more than 12 carbon atoms. Glycerine also is related to the discoloration.

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ABSTRACTER: Kathryn L. Osterhaug

4.62 ANTIOXIDANTS IN DRY FAT SYSTEMS: INFLUENCE OF THE FATTY ACID COMPOSITION OF THE SUBSTRATE

Lea, C. H.
Journal of the Science of Food and Agriculture 11, 143-150 (March 1960)

The activities of a number of antioxidants have been compared at 37° C. and 50° C. in purified distilled methyl esters of cottonseed, linseed, and cod-liver oil fatty acids, in which a small quantity of the preoxidized ester had been added as a "starter." Relative activities of the antioxidants were found to vary considerably with the fatty acid composition of the substrate and with the temperature and level of oxidation at which the measurements were made.

Doubts have often been expressed concerning the validity of high-temperature testing of antioxidants as a guide to behavior under more normal storage conditions. For the purpose of the present report, it was the author's feeling that the most satisfactory procedure for testing antioxidants at moderate temperatures would be to use a fatty substance which had been freed as completely as practicable from natural antioxidants, peroxides, and metallic contaminants, and then to add a known very small proportion of fat hydroperoxide prepared from the same material as "starter." This would be sufficient to eliminate the erratic and irreproducible lag phase that has been reported by others, which is liable to be displayed by the purified esters in its absence but that would not otherwise alter the characteristics of the system. The amount of fat hydroperoxide was approximately 0.03 weight percent in the experiments reported in the present paper.

Antioxidants used in the present work were the following: propyl gallate (PG); lauryl gallate (LG); butylated hydroxyanisole (BHA); butylated hydroxytoluene (BHT); mono-t-butylquinol (MBQ); 2, 5-di-t-butylquinol (DBQ); bis-BHT; and bis-MBQ.

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ABSTRACTER: Edward H. Gruger, Jr.

4.89 GOOD PROSPECTS FOR FISH OIL AS ORE-FLOTATION AGENT

Olden, June H. (Bureau of Commercial Fisheries, Seattle 2, Washington)
Fish Boat 5, 45 (May 1960)

It is possible that in the future fish-oil fatty acids may find a use in the flotation of iron ores.

Flotation is a process in which solid particles suspended in water are floated away on air bubbles. Bubbles do not readily adhere to most materials. In such a process, therefore, a flotation agent must be employed that will induce the bubbles to adhere to the solid particles that are to be floated away.

Success of flotation is measured by the degree of recovery of the desired mineral and the degree of purity of the concentrate. Of the 12 types of minerals present in an average ore, one or more may be separated from the others by flotation. The desired mineral may be floated off, or the reverse may occur and the valuable mineral left behind.

Research performed at the University of Minnesota, in cooperation with the U. S. Bureau of Commercial Fisheries, has shown fish-oil fatty acids to be highly effective in ore flotation.

The opportunities for applying fish oils as flotation agents vary from one ore-producing area to another. The best opportunities for fish-oil fatty acids lies in their use with iron ores that are difficult to float--where the efficiency of the flotation agent is of prime importance.

Quantities of unused ores are available that contain valuable minerals capable of being conserved with an efficient flotation agent. The high-grade iron ores of Minnesota, which are being depleted

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ABSTRACTER: Kathryn L. Osterhaug

4.5

Unsaponifiable matter and fatty acids with less than 10 carbon atoms do not contribute to discoloration. (4) Fahrion's "oxidized acids" are essential fractions of discolored oil. (5) A marked difference is found in the nitrogen content of different samples of the oxidized acids. (6) The correlation between the quantity of ammonia added to autoxidized oil and the optical densities attained deviates distinctly from a straight line. This indicates that the ammonia acts as a catalyst rather than as a partner in the reaction. (7) The dark color of the oxidized acids may be attributed to their content of carbonyl compounds, whereas the main portion of the oxidized acids is composed of colorless substances. (8) Of these carbonyl compounds, acidic carbonyl compounds are the most specific sources of the dark color. (9) By pursuing the carbonyl compounds present in autoxidized oleic acid, linolenic acid, and sardine oil, the presence of the following carbonyl compounds was verified in the respective samples:

The oleic acid: propion-, oenanth-, peralgon-aldehyde, azelaic half aldehyde, and diketostearic acid; the linolenic acid: acet-, propion-, oenanth-, peralgon-, caprin-, croton-aldehyde, azelaic half aldehyde, diketostearic acid; the sardine oil: acet-, oenanth-, croton-aldehyde, azelaic-, sebacic-half aldehyde, and diketostearic acid.

Fifty-two references are included with this paper.

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rapdily, are mixed with large quantities of lower grade ores. The taconite ores that have magnetic properties can be concentrated by a magnetic process. A large amount of nonmagnetic taconite ore with relative high iron content remains to be utilized, however.

The nonmagnetic taconites can be converted to the magnetic form by roasting and then can be concentrated by the magnetic process, or they can be concentrated by flotation. Flotation, although simpler and possibly cheaper, requires a highly efficient flotation agent. The efficiency of fish oils thus may warrant their use with nonmagnetic taconites.

Some industrial leaders believe that eventually a further concentration of magnetically concentrated iron ore will be necessary. For this concentration to be achieved, flotation would have to follow magnetic concentration. In such an operation, the use of fish oils in the reverse type of flotation--flotation of the silica from the iron ore--may eventually present the best possibility for introducing fish oils into ore flotation.

4.29

Findings.--The desired di-n-alkyl compounds became readily available when boron trifluoride was used as an acylation catalyst. Ring acylations by aliphatic acids proceeded without isomerization of the normal chains in the starting materials, and reduction yielded di-n-alkylphenols and hydroquinones, respectively. A variety of di- and tri-n-alkylphenols have been made without difficutly. The mildness of the catalyst also has permitted the acylation of sec-alkylphenols, without isomerization.

4.62

The activity of the antioxidants in a particular substrate under a given set of conditions is expressed as a "protection factor" or antioxidant index. The protection factor, here, was determined by dividing the extension of the induction period by the induction period of the control. Propyl gallate was chosen as the standard. A peroxide value of 100 μ moles per g. was taken as a convenient point at which the induction period was at an end, and was used to compare the extensions of the induction periods which constitute one of the most reproducible criteria of antioxidant activity.

Effect of substrate, temperature, and level of oxidation on the relative activity of antioxidants in fatty acid methyl esters

	Protection factors* (propyl gallate index)					
	Cottonseed	Linseed esters		Cod liver esters		
Temp.:	50°	50°	37°	50°	37°	
Measured at p.v. 10						
Control (h)	4.0	1.2	3.0	1.5	4.5	
PG	12.7 (1.0)	6.0 (1.0)	52.0 (1.0)	16.0 (1.0)	11.2 (1.0)	
LG	8.2 (0.65)	4.7 (0.78)	29.0 (0.56)	9.0 (0.56)	14.6 (1.30)	
BHA	8.4 (0.66)	6.0 (1.00)	11.5 (0.22)	12.7 (0.79)	5.7 (0.51)	
BHT	6.8 (0.54)	5.8 (0.97)	28.0 (0.54)	11.3 (0.71)	8.3 (0.74)	
bis-BHT	8.4 (0.66)	6.0 (1.00)	19.2 (0.37)	11.3 (0.71)	7.9 (0.71)	
MBQ	28.4 (2.24)	30.2 (5.03)	147 (2.83)	91.0 (5.69)	79.0 (7.05)	
bis-MBQ	29.0 (2.28)	21.4 (3.57)	38.8 (0.75)	51.7 (3.23)	48.5 (4.33)	
DBQ	3.2 (0.25)	12.2 (2.03)	50.2 (0.96)	4.7 (0.29)	19.9 (1.78)	

* Ratio of times to reach indicated p.v. -1

4.91 FURTHER STUDIES OF CHOLESTEROL, FATS AND FATTY ACIDS

Anonymous
Nutrition Review 18, 146-147 (May 1960)

Introduction. -- The quantity of cholesterol in the aorta has been used as a rough index of atherosclerosis. H. Fisher et al. (J. Nutrition 69, 163 [1959]) studied the effects of different fats and of varying quantities of dietary protein, fat, and cholesterol upon the chemical composition of the aortas of chickens.

Experiment 1. --In the first experiment, day-old male chicks were maintained on a basal ration for 1 week and then transferred to and maintained on an adjusted ration for 10 weeks. The basal ration contained soybean meal, dextrose, vitamins, and minerals. The adjusted ration provided 8 and 20 percent protein, 2 and 12 percent corn oil, and 0.3 and 2.0 percent cholesterol. After 10 weeks on the adjusted ration, the chicks were sacrificed; blood was collected for determination of cholesterol, and the aorta was removed, cleaned, and examined for degree of atherosclerosis. Aortic tissue was analyzed for cholesterol, polyunsaturated fatty acids, iodine number, and hydroxyproline.

Results. -- Amounts of 0.3 percent cholesterol and 8 percent protein in the diet resulted in greater hypercholesterolemia than did 2.0 percent cholesterol and 20 percent protein in the diet irrespective of the fat or cholesterol intake; however, the apparent degree of atherosclerosis of the aorta was greater in the birds that received the larger amounts of protein.

Experiment 2. -- In the second experiment, 8- and 20-month-old chickens were fed diets having varying degrees of saturation for 1 year. After this period of feeding, the birds were sacrificed and their aortas were examined. The chickens that received tallow in their diet grew to be heavier than

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 ABSTRACTER: Martin Heerdt

6.199 TOXICITY TO CHICKS OF HISTAMINE FORMED DURING MICROBIAL SPOILAGE OF TUNA

Shifrine, M.; Ousterhout, L. E.; Grau, C. R.; and Vaughn, R. H. (University of California, Davis)
Applied Microbiology 7, 45-50 (January 1959)

Grau and his coworkers, in 1956, found that tuna muscle that had been cooked and then allowed to spoil was toxic to chicks when fed as 30 percent of the diet, but that spoiled uncooked tuna muscle was not toxic. The toxicity was manifested in the chicks by rapid loss of weight and occasional deaths.

A number of investigators have accumulated evidence that implicates the compound histamine in the toxicity of spoiled tuna.

The investigations reported here have been designed to determine: (a) whether bacteria occurrcurring in tuna canneries have the potential to decarboxylate the histidine in the muscle, (b) whether the histamine thus produced is present in sufficient quantity to be toxic to chicks, and (c) if pure histamine has the same effect on chicks as does a meal prepared from spoiled tuna loin.

Experimental. -- Precooked tuna meat collected from commercial canneries was packed, either loosely or tightly, in 3-gallon cans and allowed to spoil. The tightly packed sample was considered to be anaerobic and the loosely packed sample, aerobic. The spoiled tuna was made into fish meal and fed to chicks (1) as a sole source of protein at 40-percent levels in a purified diet, or (2) added at the 20-percent level to a commercial chick-starter diet.

Results and discussion. -- It appears that tuna meals can be toxic to chicks if a high enough concentration of histamine is present. There are two requirements for the production of histamine:

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 ABSTRACTER: Kathryn L. Osterhaug

6.14 SHRIMP-WASTE MEAL: EFFECT OF STORAGE VARIABLES ON PIGMENT CONTENT

Rousseau, J. E., Jr.
Commercial Fisheries Review 22, 6-10 (April 1960)

Astaxanthin, a carotenoid pigment present in certain insects and crustacea, was identified by Goodwin, in 1954, as being one of the principal dietary pigments that provide coloration in trout. Hatchery-raised trout usually lack this natural and desirable coloration unless a source of the pigment, such as salmon eggs or shrimp, is included in the diet. The prohibitive cost and limited supply of these materials have prohibited their use in production-type diets; however, feeding tests conducted by Sinnhuber have shown that meals prepared from Alaska shrimp waste can be used to impart the desired natural coloration to young rainbow trout. This finding indicated a potential outlet for the considerable amount of waste being discarded annually by the Alaska shrimp industry.

The purpose of the work reported in this paper was (1) to study the method of analysis of astaxanthin pigment and (2) to determine the effect of storage on loss of pigment and on the development of oxidative rancidity in Alaska shrimp-waste meal and compare concurrently the effectiveness of antioxidants in retarding these changes.

Method of pigment analysis, procedure. -- The pigment in shrimp-waste meal is determined as follows: (1) place an accurately weighed sample of shrimp-waste meal of about 2.5 gm. in a 100-ml. centrifuge tube; (2) add 50 ml. of acetone (Baker's analyzed reagent was used in the present work); (3) shake the tube mechanically for 15 min.; (4) centrifuge the resulting mixture at about 650 times gravity for 5 min.; (5) dilute an aliquot suitable for spectrophotometric absorption measurement; (6) pipette a sample into a 1-cm. silica absorption cell; (7) determine the absorption of the acetone

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 ABSTRACTER: Kathryn L. Osterhaug

6.54 STUDIES ON THE NUTRITIONAL VALUE OF DEFATTED FISH FLOUR

Morrison, A. B. and Campbell, J. A.
Canadian Journal of Biochemistry and Physiology 38, 467-473 (May 1960)

Introduction. --The well-known high nutritional value of fish protein has prompted studies on the use of fish flour to supplement low-protein diets in underdeveloped countries. Autret and Van Veen (1955) described experiments conducted in various parts of the world by the Food and Agriculture Organization of the United Nations, in which edible fish flour was incorporated into the diets of infants and children. In almost all cases, foods containing as much as 10 percent fish flour were well accepted. Sure (1957) found that the addition of small amounts of defatted fish flour to the diet of growing rats markedly increased the protein efficiency ratio (P. E. R.) found with various cereal grains.

Purpose. --The present experiments were conducted with growing rats to provide information on the effects of the dietary protein level on the P. E. R. of fish flour and to study further the effects of fish flour on the nutritional value of whole wheat flour and white bread. Data on P. E. R., organ weights, liver lipid levels, and lysine content of the protein were obtained.

Results. --In studies on the nutritional value of defatted fish flour, groups of male weanling rats were given otherwise adequate diets that contained 7 percent, 10 percent, or 15 percent protein supplied by fish flour or casein. After 4 weeks, P. E. R. values found for 7 percent and 10 percent fish flour were significantly higher than those found for comparable levels of casein. Similar P. E. R. values were found for both proteins at the 15-percent level. The kidneys of the animals given diets containing 15 percent protein were significantly heavier than those of the animals fed the other diets, but the level or source of dietary protein had no significant effects on liver and adrenal weights, or

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CHOLESTEROL, FATS AND FATTY ACIDS

SHRIMP MEAL FOR RAINBOWS

HISTAMINE IN TUNA MEAL

VALUE OF FISH FLOUR

6.14 (Cross Reference: 6.51)

extract at a wave length of 470 mm. (Model DU Beckmann spectrophotometer was used); and (8) express the absorbency of a 100-ml. acetone extract of 5 gm. of the meal as the pigment index, $E^{5\%}_{1\ cm.}$.

The simple procedure for acetone extraction and spectrophotometric analysis just described is not specific for astaxanthin, since other pigments absorbing in the region of 470 mm. also will contribute to the total absorption and be measured as astaxanthin.

To identify the pigment, the methods of Goodwin and Srisukh (1949) were used. The results of the investigation indicated that the pigment in Alaska shrimp-waste meal is mainly esterified astaxanthin.

Three experiments were run that had as their objective the determination of the following: (1) level of antioxidants needed for retention of pigment; (2) effect of antioxidants and a synergist on pigment retention and retardation of oxidative rancidity; and (3) effect of antioxidants in meals of different moisture content.

Santoquin, but not butylated hydroxytoluene, was effective in decreasing both the rate of pigment destruction and the development of oxidative rancidity, the latter was measured by the 2-thiobarbituric acid reaction. Citric acid exhibited no synergistic effect with either Santoquin or butylated hydroxytoluene under the conditions of this study.

6.54

liver lipid levels.

In further studies, fish flour was added to whole wheat flour or to white bread prior to baking, and the resulting mixtures were fed to growing male rats at the 10 percent protein level. The addition of 2, 4, or 6 lb. of fish flour per 100 lb. of whole wheat flour increased the P.E.R. values, in a stepwise manner, from 1.49 to 2.80 but had no effect on organ weights or liver lipid levels. The addition of 10 percent fish flour to white bread made with or without 4.2 percent milk solids increased the P.E.R. values by 82 percent and 198 percent, respectively, and significantly decreased liver lipids levels. The P.E.R. values for bread and flour diets were found to be a direct function of the lysine content of the protein.

Conclusions.--The authors concluded that defatted fish flour is an excellent source of high quality protein, therefore, it should be of particular value for supplementing diets deficient in lysine.

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the chickens that received linseed oil and the chickens that did not receive fat. Levels of plasma and aortic cholesterol also increased in the older hens, and these hens received a high atherogenic score. The hydroxyproline content of the abdominal aorta increased with age. Lesions were more severe in the abdominal aorta than they were in the aortic portions.

Results.--These data indicate that the abdominal aorta of the chicken is more susceptible to atherosclerosis and contain fats that are largely saturated. With age and with more abundant dietary protein, the amount of fibrous material increases, therefore, the cholesterol content of the plasma is not the only factor that leads to atherosclerotic lesions.

Experiment 3.--In an effort to compare the degree of atherosclerosis induced by the hydrogenation of fats and that accounted for by the degermination of cereals, E. Van Handel and D. Zilversmit (J. Nutrition 69, 202 [1959]) conducted a study with rabbits. Three-month-old rabbits received diets that contained approximately 300 calories per day. The basal ration was a commercial feed to which was added cottonseed oil or hydrogenated cottonseed oil. Other diets used in this study contained generous quantities of wheat germ or sucrose. Four groups of rabbits were given 300 mg. of dietary cholesterol, whereas a control group was given sucrose without cholesterol.

Results.--All five groups of rabbits gained weight at approximately the same rate. Plasma concentrations of cholesterol increased during the 5-month period that the rabbits received either type of fat or wheat germ. The increase in cholesterol was modest in those rabbits that received sucrose with cholesterol; however, those that received sucrose alone did not show an increase in cholesterol. Examination of the aortas revealed that atherosclerosis was minimal in the group that received sucrose, moderate in the group that received sucrose and cholesterol as well as in the group that received either of the two fats, and highest in the group that received wheat germ. Hepatic cholesterol was high in both groups that received additional fat, but the amount of cholesterol in the liver did not correlate with the amount in the aorta.

6.199

(a) a high concentration of histidine must be present in the original material and (b) the tuna has to be incubated for at least 3 to 4 days. The current practice of the tuna industry normally excludes the above requirements.

Only scraps of tuna with little loin usually are used for the production of meals. Thus, the amount of histidine present is negligible. When the fish have spoiled before they are unloaded from the ship, they are used for production of meal, thus increasing the amount of histidine present. When spoiled material is precooked and allowed to incubate for 3 to 4 days, the histidine present may be decarboxylated to histamine, rendering the sample toxic. The fact that such a conversion usually is not accompanied by offensive smells makes it difficult to detect this type of spoilage.

If sanitary measures are followed in the tuna canneries and routine checks made for histamine in the meals, the toxicity of meals will be of no practical importance.

A rapid chromatographic procedure for the estimation of histamine was described, which will enable the determination of a large number of samples in a short period of time at little cost. This method will afford an easy means of checking tuna meals prior to their shipment out of the plant. Since fish meals are normally fed at near the 5-percent level in chicken diets, it is unlikely that a toxicity would be noticed even if a toxic meal was used in the feed industry since much higher levels must be fed before symptoms appear.

8.51 BIOCHEMICAL STUDIES ON PEARL. IX. AMINO ACID COMPOSITION OF CONCHIOLIN IN PEARL AND SHELL

Tanaka, Shozo; Hatano, Hiroyuki; and Itasaka, Osamu (Kyoto University, Sakyo-ku, Kyoto, Japan)
Bulletin of the Chemical Society of Japan 33, 543-545 (April 1960)

Introduction. --Conchiolin, an organic constituent of mollusc shells, was first named by Fremy. Schlossberger and Voit recognized it as a kind of protein. The amino acid constituents of this protein were studied by Krukenberg and Engel, by Wetzel (1900), and by Stary and Andratschke (1925). The amino acids prepared from conchiolin that had been obtained from different species of molluscs, were also studied by Roche, Ranson and Eysseric-Lafon (1951) and by Gregoire, Duchateau, and Florkin (1955). The composition of conchiolin was found to depend upon the kinds of molluscs from which it was prepared. The present authors found 15 different amino acids in hydrolyzates of conchiolin prepared from the pearls and the shells of pearl oysters. Halogen-containing amino acids, iodotyrosine and bromotyrosine, which are known as the peculiar components of scleroproteins obtained from calciferous skeletons of marine invertebrata such as sponge and gorgonia, were not found in conchiolin obtained from pearls and pearl shells.

Electron-microscopic studies made by Gregoire, Duchateau, and Florkin (1955) and also by Gregoire (1957 alone, showed that the physical structure of conchiolin in the shells was reticulated and unlike that of keratin or collagen, which has a fibrous structure. Chemical and crystallographical studies have shown that the nacre of pearls was identical with the nacreous layer of pearl shells but different from the prismatic layer of pearl shells. This paper deals with the results of quantitative analyses of amino acids in the hydrolyzates of conchiolin prepared from the pearl and from the two different layers of the shell of the pearl oyster.

Experimental. -- Pearls were obtained from pearl oysters, Pinctada martensii, which had been

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 ABSTRACTER: Martin Heerdt

8.59 LINGCOD MUSCLE PHOSPHOMONOESTERASES I. ACID PHOSPHATASES THAT HYDROLYZE p-NITROPHENYL PHOSPHATE

Tomlinson, Neil and Warren, R. A. J.
Canadian Journal of Biochemistry and Physiology 38, 605-612 (June 1960)

Introduction. -- Lingcod muscle contains a relatively large quantity of ribomononucleotides and other acid-soluble phosphorylated compounds. In sterile flesh, post mortem, between 75 and 90 percent of the phosphorus of these compounds is released as orthophosphate. At room temperature the release of phosphorus proceeds rapidly and is complete in about 1 day, whereas at 0° C., 1 to 2 weeks are required for the complete release of phosphorus.

Very little information is available in regard to the enzymes that presumably catalyze the release of organically bound phosphorus in fish muscle post mortem. The occurrence of both acid and alkaline phosphatases in fish muscle has been reported, and some properties of fish muscle adenosine triphosphatase have been described. Apart from this, no other information regarding the phosphatases of fish muscle appears to be available. An investigation of such enzymes from lingcod muscle has been undertaken. The present paper described the separation and some properties of five acid phosphomonoesterases from this source.

Materials and methods. -- Enzyme solutions suitable for the chromatography on diethylaminoethyl cellulose were prepared from aqueous extracts of lingcod muscle by precipitation with ammonium sulphate followed by dialysis and lyophilization of the precipitate as previously described by Tomlinson (1958). The solution must be practically free from sulphate before chromatography is undertaken. In the following report, an extract prepared in this fashion is referred to as a crude preparation.

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 ABSTRACTER: Martin Heerdt

9.13 FAT METABOLISM IN THE FISH. II. INTESTINAL ABSORPTION AND DISTRIBUTION STUDY OF OIL IN THE CARP, CYPRINUS CARPIO LINNE

Kayama, Mitsu and Tsuchiya, Yasuhiko (Tohoku University, Sendai, Japan)
Tohoku Journal of Agricultural Research 10, 229-236 (June 1959)

Introduction. -- Many kinds of labelled fatty acids have been used in studies on absorption, transportation, and distribution in the rat, cat, dog, man, and cow. These fatty acids include elaidic acid, acids containing iodine, acids containing conjugated double bonds, and acids containing isotopes such as deuterium or radioactive carbon 14.

Purpose. --The present study is concerned with the absorption, transportation, and distribution of lipids in carp. The fatty acid used was stearic acid-1-^{14}C dissolved in cottonseed oil. Results that were obtained in this study were compared with results obtained by the authors' (1958) in a previous study of conjugated fatty acids in carp and with results obtained in the rat studies of Bergstrom, Borgstrom, and Rottenberg (1952).

Experimental. -- A previously reported catheter method, somewhat modified was used to place labelled oil into the pre-intestine of carp that were subjected to urethane anesthesia. The carbon 14 activities of the lipids present in the various tissues and organs were determined by a direct-mount technique.

Findings. -- Intestinal absorption increased with time and decreased with the rate at which the intestine was able to empty. Intestinal absorption in poikilotherm carp proceeded more slowly at a summer, water temperature of 22° to 25° C. than did intestinal absorption in the rat. The amount of the labelled oil that was absorbed after 2, 4, 6, and 10 to 12 hours was, respectively, 30, 50, 60 to 70, and 80 to 90 percent. About 10 percent of the labelled oil appeared in the feces. Relative

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 ABSTRACTER: Martin Heerdt

9.7 MARINE BIOLOGY LABORATORY IN RANDOLPH (MASS.) HIGH SCHOOL

Anonymous
Commercial Fisheries Review 22, 16-18 (April 1960)

Students in the sophomore class at Randolph High School in Randolph, Massachusetts, a suburb of Boston, are making contributions to marine biology and oceanography through a recently well-organized oceanographic laboratory at the school. The laboratory and its procedures were set up by biology instructor, Kenneth Sherman, a former employee of the U. S. Fish and Wildlife Service's Division of Biological Research. The Randolph High School laboratory copies of the research methods and problem-solving techniques of the Service's biologists. It is hoped the laboratory will aid in the development of oceanographic scientists for the future, and at the same time contribute in some small way to ocean science.

The emphasis on ocean research is recent. Here is a frontier of science to challenge the imagination of any alert student. Problems concerning every basic biological concept are present. Here is an environment that presents a great opportunity for original investigation. Little or nothing is known concerning a large number of common marine organisms, especially those which have no particular commercial importance. The physiology, morphology, and ecology of only a small number of marine organisms is now generally understood. There are many gaps in our knowledge concerning the fishes and other marine organisms of the North Atlantic coast. As a result of this lack of knowledge and increased interest in the oceans, the Randolph High School oceanographic laboratory was formed. The laboratory has given the participating students a unique opportunity to become familiar with research methods and problem-solving techniques.

The laboratory began with a small group of students with high aptitudes and a genuine curiosity

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8.59 (Cross Reference: 2.02, 7.591)

Phosphomonoesterase activity was measured by a determination of the p-nitrophenol released from disodium p-nitrophenyl phosphate. The reaction mixture contained 0.025 M sodium succinate buffer of an appropriate pH, 0.018 M substrate, other additions as indicated, and the enzyme. Controls with the enzyme omitted were used. The incubation temperature was 25° C. Aliquots (0.33 ml.) of the reaction mixture were removed immediately after the addition of the enzyme and again after a suitable period of incubation. These were mixed at once with 1 ml. of 0.1 N NaOH, and the optical densities of the solutions were measured at 400 mμ. The quantity of p-nitrophenol formed was determined by reference to a calibration curve. When certain salts (for example, those of manganese) were added to the reaction mixture, the precipitate, which formed on addition of the alkali, was removed by centrifugation before a measurement of the transmission of light was made.

The chromatography of protein on diethylaminoethyl cellulose in the free-base form and the procedures for protein and light absorption measurements have been previously described by Tomlinson (1959).

Results.--Five fractions (A to E), each possessing acid phosphomonoesterase activity, were separated from an aqueous extract of the muscle of lingcod (Ophiodon elongatus) by stepwise chromatography on diethylaminoethyl cellulose in the free-base form.

Fraction A required Zn^{++} or Mn^{++} for activity, was inhibited by heparin, and had an optimum pH of 6.0. Fraction E required Zn^{++} for activity, was not inhibited by heparin, and had an optimum pH of 5.5. Fractions B, C, and D did not require metal ions for activity and were distinguished from each other by differences in response to pH, cysteine, ethylenediaminetatraacetate, fluoride, and tartrate.

The pH range, over which fraction A was active, was shifted to slightly higher values when Mn^{++} was the activator in place of Zn^{++}. Fraction A also was inhibited strongly by cysteine when activated by Zn^{++} but not when activated by Mn^{++}. The data presented indicate that these differences were due to different properties of the activating ions,

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concerning the oceans. The students were selected on a competitive basis. The five classes of sophomore biology students were given two lessons concerned with the cycle of life in the ocean with particular emphasis on its origin, economic importance, and untapped resources. The students were then required to complete a report of approximately 1,500 words entitled, "The Cycle of Life in the Oceans," using at least three different reference books. Those students that produced the most comprehensive reports were later interviewed and from this group, ten who showed a genuine curiosity, interest, and aptitude were selected to become staff members of the laboratory.

The students were then encouraged to familiarize themselves with the oceanographic literature. They discussed their findings at a meeting where it was generally held that while there were a great many excellent problems to work on, many were impractical from the standpoint of available equipment, time, and the difficulty of securing adequate samples. It was decided to begin the studies with readily available fish which not only provided interesting problems but also the opportunity to secure valuable scientific data.

The investigations currently in progress are concerned with the food habits, fecundity, growth, and distribution of some marine fishes of the Atlantic Coast. One of the studies includes the tagging of the commercially important cod, Gadus callarias, in an effort to determine the distribution pattern. A 16-foot 18-horsepower motorboat is used for tagging along the coast.

Another project is concerned with determining the distribution patterns of the haddock, Melanogrammus aeglefinis, by attempting to use the infestation pattern of attached parasites as natural tags. Students are also working on other problems. The food habits of the winter flounder, Pseudopleuronectes americanus, the tomcod, Microgadus tomcod, and the Atlantic cod, Gadus callarias, are under investigation by individual students. Some fish are collected by hand-lining from the laboratory's 16-foot boat, whereas others are obtained from cooperative fishermen in the local ports of Boston, Cohasset, Scituate, and Hull.

8.51

cultured in a pearl farm at Matoya Bay near Kashkiojima for two winters. Shells were obtained from the same pearl oysters. The nacreous substance of pearls was obtained from crushed pearls. The nacreous substance of shells was obtained from shell valves by grinding off the prismatic substances after first removing the seaweed and other adhering materials from the surface. The prismatic substance of shells was obtained from the thin, posterior shell margins. All materials were crushed and pulverized into powder of about 10 mesh, washed with tap water, and dried at room temperature.

Conchiolin was prepared from the above materials. The materials were immersed in 1 N hydrochloric acid solutions, which were frequently renewed, until no more evolution of carbon dioxide was observed in vacuo. Insoluble matter was washed several times with distilled water and was dialyzed against running water until the chloride ion in the dialyzate became undetectable. The conchiolin prepared from the nacre of pearls and from the nacreous substance of shells had a faint yellowish color, whereas that prepared from the prismatic layer of shells, had a reddish-brown tint.

About 50 mg. of pulverized conchiolin was hydrolyzed with 5 ml. of 6 N hydrochloric acid at 100° C. in a sealed tube for 30 hr. The small amounts of humin that formed were filtered off. Hydrochloric acid was evaporated in vacuo repeatedly. The resulting hydrolyzate was dissolved in a mixture of n-butanol, n-propanol, and 0.1 N hydrochloric acid (1 : 2 : 1, volume for volume). Amino acid analyses were carried out chromatographically by the method of Stein and Moore (1948 and 1949) on starch columns.

Results.--Relatively large amounts of leucine, alanine, glycine, and cystine were found in both conchiolin from the pearls and from the shells. Proline was recognized only in conchiolin from the prismatic substance of the shell. Conchiolin contained a relatively large amount of cystine, the presence of which suggests a fibrous structure like that found in the keratin of human hair and skin. Conchiolin in the nacreous layer of the shell and the pearl contained less phenylalanine and proline, and more alanine than was found in conchiolin from the prismatic layer.

9.13

specific activities of the lipids present in the different tissues and organs were plotted hourly. The distribution of the absorbed fat was calculated 10 hours after feeding.

The pre-intestine of the carp, which looks like a stomach, acts functionally as an intestine and readily absorbs the administered oil. The so-called IKE KOMI or IKE SHIME custom of the Japanese fish-culturist was justified on the basis of the previously reported findings.

4.14 FATTY ACID COMPOSITION OF NORTHERN ELEPHANT SEAL OIL

Tsuyuki, Hideo (Univ. Nihon)
Chemical Abstracts 53, 14548a (August 10, 1959)

4.14 SEPARATION OF WAX FROM SPERM OIL

Higashi, Katsumi; Kojiro, Iwao; and Tsukamoto, Saburo (Taiyo Fishery Co., Ltd.)
Chemical Abstracts 54, 5133d (March 10, 1960)

4.14 METHODS OF ANALYSIS OF SPERM WHALE OIL AND ITS DERIVATIVES

Moldavskaya, S. A. and Dmitrieva, E. S.
Chemical Abstracts 54, 8114c (April 25, 1960)

4.29 PREPARATION OF A COATING MATERIAL BY CHLORINATION OF FISH OIL V. AERATION VELOCITY OF CHLORINE

Suzuki, Kosaku
Bulletin of the Japanese Society of Scientific Fisheries 25, 218-221 (July 1959) (English abstract, figures, and tables)

Relations between the rate of chlorine aeration, yield of the product, and agitation of the reaction mixture were studied with the assumption that the apparent chlorination velocity of fish oil is proportional to the yield of the product.

VI. Influence of hydroxy groups and peroxides in fish oil on chlorination.--Ibid. 632-635 (December 1959). Chlorination of fish oil appears to be retarded because of changes in the autoxidation of the oil and not only as the result of the formation of hydroxy groups and peroxides. Autoxidized oil yielded a chlorination product little increased in chlorine content, even when it had been strongly reduced in acetyl value before chlorination.

4.29 EXPOXIDATION OF WHALE OIL

Dybakova, N. A.; Zilberman, E. N.; and Berlin, A. A.
Chemical Abstracts 54, 8114e (April 25, 1960)

6.190 QUALITY OF PROTEIN IN DIFFERENT KINDS OF FISH POWDER (MEAL)

Vinokurova, A.
Chemical Abstracts 53, 8469d (May 10, 1959)

6.190 BIOLOGICAL QUALITY OF DILIS FISH FLOUR USED AS SOURCE OF PROTEIN FOR GROWING RATS

Alcaraz-Bayan, Angelina and Leverton, Ruth M. (Oklahoma State Univ., Stillwater)
Chemical Abstracts 53, 13441i (July 25, 1959)

6.190 CONDENSED FISH SOLUBLES. A REVIEW OF ITS PREPARATION AND PROPERTIES

MacLeod, Robert A.
Journal of the Fisheries Research Board of Canada 16, 685-692 (October 1959)

(Abstract of this article appears under 6.15 page 17 - May 1960)

6.190 RELATION OF RESIDUAL OIL AND MENHADEN FISH MEAL QUALITY

Meade, Thomas L. and McIntyre, Russell T.
Chemical Abstracts 53, 22588b (November 25, 1959)

6.31 STUDIES ON THE METABOLISM OF ALGAE II. THE EFFECTS OF AMINO ACIDS, VITAMINS AND PYLORIC CAECA EXTRACT ON THE GROWTH OF DIGENEA SIMPLEX

Kashiwada, Ken'ichi; Kakimoto, Daiichi; and Kanazawa, Akio
Bulletin of the Japanese Society of Scientific Fisheries 25, 100-102 (June 1959) (English abstract and tables)

Growth of Digenea simplex was improved by addition of casein hydrolyzate, vitamin mixture, and pyloric caeca extract of skipjack as in the case of Porphyra. The addition of vitamin B_{12} allowed a considerably growth of Digenea when added in much smaller quantity, about 0.002 to 0.02 γ per liter of sea water. The further addition of vitamin B_{12} was without apparent effect.

6.31 RESISTANCE OF ALGAE TO RADIATION

Godward, M. B. E. (Queen Mary College, Mile End Road, London, England)
Nature 185, 706 (March 5, 1960)

Experiments carried out since 1954 have shown that various algae are much more resistant to radiation than are higher plants and animals.

LIST OF PUBLICATIONS REGULARLY ABSTRACTED

Analyst
Analytical Chemistry
Applied Microbiology
Archives of Biochemistry and Biophysics
ASHRAE Journal
Bacteriological Reviews
Biochemical Journal
Biochemistry (U. S. S. R.)
Bulletin of the Chemical Society of Japan
Bulletin of the Faculty of Fisheries, Hokkaido University
Bulletin of the Japanese Society of Scientific Fisheries
California Fish and Game
Canadian Fisherman
Canadian Journal of Biochemistry and Physiology
Canadian Journal of Chemical Engineering
Canadian Journal of Chemistry
Chemical Abstracts
Chemical Engineering
Chemical and Engineering News
Chemical Processing
Chemistry and Industry
Commercial Fisheries Review
Drug and Cosmetic Industry
Federation Proceedings
Feed Bag
Feedstuffs
Fish Boat
Fisheries Newsletter (Australia)
Fish. Res. Bd. Can., Prog. Repts. Atlantic Coast Stas.
Fish. Res. Bd. Can., Prog. Repts. Pacific Coast Stas.
Fishing Gazette
Food Engineering
Food Manufacture
Food Preservation Quarterly
Food Processing
Food Research
Food Technology
Frosted Food Field
Industrial and Engineering Chemistry
Industrial Refrigeration
Journal of Agricultural and Food Chemistry
Journal of Applied Chemistry
Journal of Bacteriology
Journal of Biochemistry (Japan)
Journal of Biological Chemistry
Journal of Lipid Research
Journal of Nutrition
Journal of the American Chemical Society
Journal of the American Dietetic Association
Journal of the American Oil Chemists' Society
Journal of the Association of Official Agricultural Chemists
Journal of the Fisheries Research Board of Canada
Journal of the Japanese Biochemical Society
Journal of the Science of Food and Agriculture
Maine Coast Fisherman
Modern Packaging
Modern Refrigeration
National Fisherman
National Provisioner
Nature
Nutrition Reviews
Pacific Fisherman
Poultry Science
Progressive Fish-Culturist
Quick Frozen Foods
Science
Seafood Merchandising
Trade News (Fisheries Department, Canada)
Western Canner/Packer
Western Fisheries
World Fisheries Abstracts
World Fishing

Articles chosen for abstracting or inclusion as bibliographical references are those deemed of interest to the commercial fisheries and to fishery technological laboratories. Occasionally pertinent articles from sources other than the above-listed publications are included. Biological papers are generally omitted.

6.34 ALGINIC ACID, COMPOSITION, PROPERTIES, AND USES

Vedrinskii, A. I.
Chemical Abstracts 53, 14422h (August 10, 1959)

6.34 IDENTIFICATION OF ALGINATES IN MILK PRODUCTS

Pien, Jean
Chemical Abstracts 53, 19201i (October 25, 1959)

6.34 ALKALINE DEGRADATION OF ALGINATES

Whistler, Roy L. and BeMiller, J. N. (Purdue University)
Journal of the American Chemical Society 82, 457-459 (January 20, 1960)

Alginates are readily degraded by alkaline solutions at 80° to 120° with the formation of new 6-carbon, dicarboxylic saccharinates, 3-deoxy-2-C-hydroxymethylpentarates.

7.51 DETERMINATION OF ACTOMYOSIN IN FISH MUSCLES

Pershina, L. I. (Sci.-Research Inst. Mechanization Fish Ind. Leningrad)
Chemical Abstracts 53, 11699e (June 25, 1959)

7.51 (Cross Reference: 3.2491, 3.331)

STUDIES ON THE DISCOLORATION IN FISH MEAT DURING FREEZING STORAGE II. A SPECTROPHOTOMETRIC METHOD FOR THE SIMULTANEOUS DETERMINATION OF FERROUS AND FERRIC FORMS OF MYOGLOBIN IN TUNA MEAT

Sano, Yoshihiko; Hashimoto, Kanehisa; and Matsuura, Fumio
Bulletin of the Japanese Society of Scientific Fisheries 25, 285-289 (August 1959) (English abstract, figure, and tables)

The method reported in part I on pure myoglobin (Mb) solution was found to be applicable to extracts prepared from tuna meat.

7.51 (Cross Reference: 0.7)

A COMPARISON OF SEVERAL METHODS FOR ESTIMATING THE NUTRITIVE VALUE OF PROTEINS

Rippon, W. P.
Chemical Abstracts 54, 6894e (March 25, 1960)

7.80 STUDIES ON FRESHNESS DETERMINATION OF FISH MEAL BY THE DISTILLATION RATIO OF VOLATILE ACIDS. IX. ON THE APPLICABILITY OF D.R. VALUE TO THE DETERMINATION OF THE FRESHNESS OF OYSTER

Asakawa, Suezo
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 9, 714-718 (1959) (English abstract and tables)

Distillation ratio (D.R.) value was measured on the Japanese oyster, Crassostrea gigas, during the course of the deterioration of its freshness. The results indicated that the D.R. value of very fresh oysters is smaller than that of fish flesh and that the value decreases rapidly as the freshness decreases.

7.80 A NEW METHOD FOR ESTIMATING THE FRESHNESS OF FISH

Saito, Tsuneyuki; Ken-ichi, Arai; and Matsuyoshi, Minoru (Faculty of Fisheries, Hokkaido University)
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 9, 749-750 (1959) (In English)

The freshness of raw or frozen fishes may be judged by estimating their contents of inosine and hypoxanthine. Two grams of fish muscle was ground by hand in a mortar with 20 ml. of 4-percent cold perchloric acid solution. The extract was filtered, and 10 ml. of the filtrate was used for analysis. Hypoxanthine, inosine, and nucleotides were separated by the hydrochloric acid gradient elution system on Amberlite IRA-400.

8.0 SEASONAL VARIATION OF THE CHEMICAL COMPOSITION OF THE MUSSEL (MYTILUS EDULIS) II. CARBOHYDRATES

Fraga, F. (Inst. Investigaciones Pesqueras, Barcelona, Spain)
Chemical Abstracts 53, 22530c (November 25, 1959)

8.0 CHEMICAL ANALYSIS OF EDIBLE ASCIDIANS

Maragliano, G. A. and Sebastion, C. (Inst. talassografico, Taranto, Italy)
Chemical Abstracts 53, 22589c (November 25, 1959)

8.0 PROXIMATE ANALYSIS OF MARINE STANDING CROPS

Parsons, T. R. and Strickland, J. D. H. (Fisheries Research Board of Canada, Pacific Biological Station, Nanaimo, B. C., Canada)
Nature 184, 2038-2039 (December 29, 1959)

Proximate analyses were made of the bulk of the biomass from a sample of sea water, which consisted of microscopic particles that pass through the coarser plankton nets.

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8.42 CALCIUM AND ELECTRIC POTENTIAL ACROSS THE CLAM MANTLE

Kirschner, Leonard B.; Sorenson, A. L.; Kriebel, Mahlon (Washington State University, Pullman)
Science 131, 735 (March 11, 1960)

An excised clam mantle develops a potential difference, shell side positive, when both surfaces are bathed by tap water or physiological saline solution. The magnitude and sign of the potential are sensitive to the calcium concentration in the bath solution. Carbon dioxide bubbled through the solution bathing the shell side increased the potential.

8.42 SODIUM ION, POTASSIUM ION, AND WEIGHT CHANGES IN FISH HELD IN REFRIGERATED SEA WATER AND OTHER SOLUTIONS

MacLeod, Robert A.; Jonas, R. E. E.; and McBride, J. R.
Journal of Agricultural and Food Chemistry 8, 132-136 (March-April 1960)

(Abstract of this article appears under 3.12 page 7 - July 1960)

8.51 PRESENCE OF MYOGLOBIN IN "CARTILAGE" OF THE MARINE SNAIL BUSYCON

Lash, James W. (Department of Anatomy, University of Pennsylvania, Philadelphia)
Science 130, 324 (August 7, 1959)

The odontophore of the snail Busycon has been found to contain myoglobin. The red pigment is readily extracted with water, and spectrophotometric analysis shows the characteristic peaks of myoglogin at 575 and 539 mμ. Although the odontophore is considered to be cartilaginous, it contains, not a chondroitin sulfave, but a polyhexose sulfate. This unusual chemical composition may be responsible for the absorption of myoglobin by the odontophore.

8.51 AMINO ACIDS FROM "NUOC-MAM" PROCESSED AT DAKAR

Toury, J.; Lunven, P.; Giorgi, R.; and Raoult, A.
Chemical Abstracts 53, 16408d (September 10, 1959)

8.51 AMINO-ACID COMPOSITION OF WHALE MEAT

Ogawa, Tetsuo; Tsunoda, Toshinao; and Osawa, Makio
Chemical Abstracts 53, 16407d (September 10, 1959)

8.51 FURTHER STUDIES OF INOSINIC ACID FORMATION IN CARP MUSCLE

Saito, Tsuneyuki and Arai, Kenichi
Bulletin of the Japanese Society of Scientific Fisheries 23, No. 9, 579-580 (1958) (In English)

The deamination process of AMP is so rapid that as changes occur in muscle tissue or in muscle homogenate and are accompanied by ATP splitting, considerable amounts of IMP accumulate and slowly are converted into inosine and hypoxanthine.

8.51 FREE AMINO ACIDS AND RELATED COMPOUNDS IN THE BRAINS OF FISH, AMPHIBIA, REPTILES, AVES, AND MAMMALS BY ION EXCHANGE CHROMOTOGRAPHY

Okumura, Nikichi; Otsuki, Saburo; and Aoyama, Tatsuya (Okayama Univ. Med. School)
Chemical Abstracts 53, 9490e (May 25, 1959)

8.51 FREE AND COMBINED AMINO ACIDS IN THE FLESH AND LIVER OF BALTIC COD

Dabrowski, Teofil and Ganowiak, Zenon (Wojew. Stacja Sanit.-Epidemiol., Gdansk, Poland)
Chemical Abstracts 53, 11680i (June 25, 1959)

9.15 COPPER, A POSSIBLE BARRIER TO OYSTER DRILLS

Glude, John B. (U. S. Fish and Wildlife Service, Annapolis, Maryland)
Chemical Abstracts 53, 2494h (February 10, 1959)

9.15 THE IDENTITY OF THE LARVAL NEMATODES FOUND IN THE BODY MUSCLES OF THE COD (GADUS CALLARIAS L.)

Grainger, J. N. R. (Department of Zoology, The University, Hull, England)
Parasitology 49, 121-131 (May 1959) (Great Britain)

The larvae and pre-adults of both genera are described. Samples of larvae from cod from Greenland and the Barents Sea probably consist only of Porrocaecum and Anisakis, but a sample from West Scotland contained only Porrocaecum. The significance of the moult to the preadult state is discussed.

9.15 EFFECT OF THE INGESTION OF TRIANOPHORUS PLEROCERCOIDS ON THE NUTRITIONAL CHARACTERISTICS OF WHITEFISH FILLETS IN THE RATIONS OF PUPPIES

Crampton, E. W.
Journal of the Fisheries Research Board of Canada 17, 81-90 (January 1960)

(Abstract of this article appears under 2.9 page 7 - July 1960)

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